HELSINKI SCHOOL OF ECONOMICS (HSE)
Department of Business Technology

THE MYTH OF UNIFIED MODELS OF TECHNOLOGY ADOPTION

A Comparative Study on Personally and Socially Consumed Mobile Services – Case Lyyra

Information Systems Science
Master´s thesis
Jorma Kaista, k78875
Spring 2008

Approved by the Head of the Department of Business Technology 12 / 5 2008, and

awarded the grade Excellent, 90p.

Anssi Öörni Petri Hallikainen

HELSINKI SCHOOL OF ECONOMICS (HSE)
Master's thesis, spring 2008

Jorma Kaista
k78875

Abstract

The goal of the study was to find out whether the 1) learning mechanisms and importance of information sources, 2) beliefs affecting attitudes and 3) relative importance of attitudes and social norm are different between two adoption categories: personally and socially consumed mobile services.

To form the research categories, selected existing mobile services were divided into personally and socially consumed mobile services. A comparative study between these two categories was conducted to find possible differences.

The study contains a comprehensive literature review about earlier studies in the field of innovation diffusion and adoption behavior. The most central theories include Diffusion of Innovations theory, Theory of Reasoned Action, Uses and Gratifications and several mobile technology adoption studies.

Target group of the study consist of university-level students in Finland, in more detail owners of Lyyra student card. The context of the empirical study allowed also examination of the sights of mobile internet usage among Finnish students during the near future.

Empirical part of the study includes a pilot study conducted with 50 students and a comprehensive survey with two questionnaires both sent to 1000 students. A total of 262 answers were gotten from the total 2000 sent response inquires.

The proposed research model was tested with multivariate regression analysis separately with both of the research categories. The final models for personally and socially consumed mobile services implicate that many of the constraints of attitude presented in earlier studies aren't always significant enough to be considered when measuring intention to use mobile services. Also it was found that beliefs behind attitudes differ between the two categories. These findings question the meaningfulness of general, even universal, models of (mobile) technology acceptance presented in earlier literature. Therefore it could be argued that in the case of mobile services, the type of the service in question must be taken into account when trying to determine end-users' intention to use the service.

Results of the study indicate that there are two main issues a mobile service provider has to take into account when introducing a new mobile service. Firstly, it is important to notice the relative importance of different information sources. Considering both personally and socially consumed mobile services, own experiences with the service as well as information from friends, family and colleagues were considered more important sources of information than media and advertisements. Secondly, a mobile service provider has to acknowledge the decision criteria the users have considering the service or service category at hand and emphasize these issues in their product design and marketing.

Keywords: technology adoption, mobile internet, mobile social media, 3G, innovation diffusion, network, mobile services, telecommunication, telecom, cellular services

Table of Contents

Table of figures

List of tables

1 Introduction

The goal of this study is to examine and find possible differences in information sources and beliefs affecting consumer decisions concerning adoption of personally and socially consumed mobile services. This is done by studying the different constructs affecting the adoption of mobile services among students, and by collecting data about their attitudes and intentions to adopt mobile services during the next six months. A categorization of mobile services to personally and socially consumed mobile services is also presented. In short, the main goal is to find out whether there is distinction between the factors affecting the adoption of personally and socially consumed mobile services.

Target group of the study consist of university-level students in Finland. With this study I also try to examine 1) how willing students are to use different kinds of mobile services and 2) what kind of services students find meaningful and useful. The context of the empirical study allows me also to examine with the collected data the sights of mobile internet usage among Finnish students during the near future.

There are already some previous studies about issues relating to mobile service adoption, but most of the studies have concentrated to only one kind of service (e.g. Luarn & Lin 2005, Mallat et al. 2008) or then tried to form a unified model to predict the adoption of any mobile service (e.g. Wang et al. 2006). In my best knowledge, there are no earlier comparative studies like this one concentrating on personally and socially consumed mobile services. Hence this study offers new information for the whole body of adoption research.

1.1 Subject and reasoning of the study

In this study I combine my interest towards mobile internet, mobile services, mobile social media and web 2.0 phenomenon in mobile context. As a subject mobile internet and mobile services are extremely interesting and current: for example in Finland there is already over one million 3G (third generation) mobile users (fifth of the population) compared to c. 50 000 users three years ago (ITviikko.fi, 31.12.2007). Also the use of mobile services has increased: according to Statistics Finland the total amount of packet data transfers tripled form 2005 to 2006 as it reached almost 100 000 gigabytes. In the year 2007 the growth was even stronger as

the amount of transferred data was seven times bigger than year before (ITviikko.fi, 31.12.2007).

The expansion of 3G use in Finland is probably affected by the change in Finnish legislation in April 2006, which allowed the operators to subsidy the price of a 3G-phone. This has made the purchase of a 3G-mobilephone possible for many consumers. In addition most of the telecom operators are now offering a flat rate (fixed, monthly payment) data plans (known as "mobiililaajakaista") for as low price as ten euro per month. The pricing of mobile services has become clearer for business users as well and many users can explore the mobile web freely with no additional cost.

As MySpace, Facebook, Jaiku and other social web services continue to gain new users, and at the same time mobile internet use is growing, it is natural to also concentrate on the possibilities and limitations of mobile applications of those. The social communities in the web are especially tools to communicate: people share their thoughts and doings with friends (for example microblogging, Jaiku, Twitter, status updates in Facebook). Mobile phones and other devices bring a new dimension to social media services when text, pictures, video and sound can be shared with others in real time (Yamakami 2007). This makes mobile social media very interesting.

The students can be a good target group for mobile services. As Funk (2004) points out, one of i-mode's mobile internet services success factors in Japan was their focus on totally new customers: young people. Focusing on new customers made it possible to focus on new kinds of services, mainly entertainment, shopping and games, which in addition to email constituted the main part of the Japanese mobile Internet market in 2002.

New generation of mobile devices with new kind of user interfaces such as Apple's iPhone and upcoming Windows Mobile 7 as well as Nokia's upcoming multimedia phones with touch screens or phones utilizing Google Android operating system can bring changes to the ways people experience and use internet services on their mobile devices. These new devices with their bigger screens and more intuitive user interfaces combined with always on data connections can in the near future fulfill the dream of ubiquitous (mobile) internet experience anywhere anytime.

Relation to previous studies

This study relates to previous studies on innovation diffusion research (e.g. Rogers 2003) as well as to research on consumer behavior (e.g. Ajzen & Fishbein 1980) and acceptance of new technology and services (e.g. Venkatesh et al. 2003, Davis 1989). Also some previous studies have been done considering mobile technology and mobile services (e.g. Kaasinen 2005, Wang et al. 2006). These are discussed in more detail in chapter 5.5.

Use of 3G phones and willingness to use mobile services has been previously studied for example by Hartikainen (2007), who recognized three different groups (adopted from Rogers 2003) 1) Innovators and early adopters, 2) Majority and 3) Laggards and late adopters. Persons belonging to first or second group were willing to use mobile services in the near future although particularly 'Majority' representatives eagerness was limited as they found the price of the services too high (Hartikainen 2007). The use environment and pricing of mobile internet in Finland have however changed substantially after Hartikainen's study as fixed pricing of mobile internet use has become available for almost all customers of Finnish mobile operators.

Web 2.0 (O'Reilly and Associates, 2004) and social web services are a reasonably new phenomenon, still there has already been quite a lot research on the area. Most of the studies are from the marketing (for example crowd sourcing and viral marketing) or social psychology perspective (human behavior in web communities). Thus mobile use of community services and mobile social media has not been much examined yet. Some research on the area exists though for example by the VTT Technical Research Centre of Finland (see Toivonen 2007).

Significance of the study for research and practice

As Nysveen et al. (2005) point out, "it is important to understand the driving forces of consumers' intentions to use mobile services and to adopt the services to fulfill consumers' motives for using them." In practice conclusions of the study can be applied when designing mobile internet services targeted for students and young people and also when making decisions of how to promote them with the appropriate channels to reach the students.

To information systems and marketing research as well as to consumer behavior literature the study brings new value by comparing different service categories as most of the previous studies on the area have concentrated on only one service.

There are (to my knowledge) no earlier studies comparing reasons of adoption between the two categories presented in this study. Mobile services form such a wide area that, intuitively judged, reasons for adoption can't be same for all kind of services. Hence it is important to make comparative studies in the field. I must however point out that this same reason forms some limitations for this study as I have tried to divide practically all mobile services (excluding games) into only two categories. The aim of this study is however to prove that reasons of mobile services adoption are dependent on the type of the service in question and thus the categorization was needed.

1.2 Background of the study and description of the concept

Oy Suomen Lyyra Ab is a company owned by HYY Yhtymä (owned by the student union of university of Helsinki) and The National Union of University Students in Finland (Suomen ylioppilaskuntien liitto, SYL) which maintains Lyyra student card system and a web service relating to the student card. Website www.lyyra.fi is a virtual meeting place for 300 000 students with which the activity that belongs to student life gets a new shared channel. The Lyyra website was introduced in October 2007 and at the moment one can meet friends and get new contacts, form groups, write a blog, upload photos, check upcoming parties and other activities, visit the flee market, and chat. Lyyra card can also be used for payments for example on some campus cafeterias and users visit lyyra.fi to transfer money to their card. At the moment Lyyra has no services optimized for mobile use.

Social media websites, such as MySpace and Facebook, have been the success stories of the internet during the last couple of years. Lyyra has a possibility to bring a new perspective to web communities by combining the physical day to day life of students with the virtual Lyyra community in a totally new way.

It has been said that social web communities form freely and they are hard to control. In Lyyra's case there is already a pool of potential users (approximately 300 000 students) who

have a Lyyra card. Lyyra card owners use the web service to transfer money to the card (to be able to use it for payments), thus some web traffic is guaranteed. A question remains though, how to get the users to use also the social/community features provided by the service.

University students have been seen as pioneers and early adopters for social web services. But in a way this is part of the challenge as well – Facebook, for instance is already so popular among Finnish students that it is maybe not wise to try to compete directly with that. Thus it is crucial to Lyyra to find new innovative features to tempt students to use the service. Cool mobile services customized to the specific needs the students have can be one way to gain competitive advantage towards other similar services. Nysveen et al. (2005) propose that the use of mobile services may be a way to express personality, status and image in a public context, which all can be important values to students searching their place in the community.

One of the strengths of Lyyra is the fact that all of its users already have a common factor: they all are university students, and on more local level they form groups of people studying in the same place. However physical communities and experienced communities often aren't the same thing (Blanchard & Markus, 2002).

In addition to the community aspect of Lyyra web service, it also works as an information source in many subjects concerning studies and student life. One goal of this study is to examine, weather the users would like to get up-to-date information on these subjects on their mobile devices. Examples of such services could be information about today's menu on student cafeterias, or one would maybe like to check the time and place information of a party or to see a list of friends attending the party or information about special offerings for students.

Maybe in the future the social network provided by Lyyra could connect not only the students but also help them keep contact with the faculty and staff of their university, as has already been seen to happen in some colleges in the US (ABC news, 11.9.2006).

1.3 Research problem and questions

User acceptance of mobile services has been studied previously mostly one service at a time (e.g. Luarn & Lin 2005, Mallat et al. 2008). Others have tried to form a unified model to be used for all mobile services (e.g. Kaasinen 2005, Wang et al. 2005, Lu et al. 2008). This study aims to prove that beliefs affecting attitudes behind intentions to use mobile services are at least to some extent different between personally and socially consumed mobile services and thus any unified model for mobile services adoption is to some extent artificial.

There are already many mobile services and services providers available for the consumer to choose from. However technological advances do not automatically lead to widespread adoption (Constantiou et al. 2007) and potential customers may not adopt services although they are available to them (Wang et al. 2006). This generates a need for a study about the factors affecting consumers', in this case students', intentions to use mobile services.

Main research question:

1. *Among Finnish students, what are the information sources, key attributes and beliefs affecting user adoption of personally and socially consumed mobile services*

Supplementary research questions:

2. *Do these attributes and beliefs differ between the two categories?*
3. *Do these information sources differ between the two categories?*
4. *What kind of services do the users find meaningful to use with mobile device?*
    - *Especially Lyyra's services*

Viewpoint of the study is practical and the goal is to produce objective estimates of/for Lyyra's possible mobile services in the end user perspective.

1.4 Focus

The study concentrates primarily on mobile services adoption and their use; the different services and their specific functionalities are not a matter of primary interest. The target audience for empirical study is consumers, in more detail students – business users and organizational context is left outside this study.

Questions relating to business models or revenue logic of mobile services are not in the focus of this research.

The main goal is to study mobile services which are used either over internet or as a downloadable application. Talk and verbal communication (voice or video calls, push-to-talk) as well as SMS/MMS messaging services are excluded from the study focus.

In research's focus are for example:

- WAP, GPRS, 3G, EDGE, UMTS, WLAN/Wi-Fi, WiMAX
- Mobile internet and internet usage with mobile devices
- Mobile social media
- Mobile multimedia services
- Websites customized for mobile experience
- (Mobile) email, Instant messaging (IM), chatting

2 Important terms and concepts

Mobile internet refers to entity of internet sites used with mobile devices. Earlier the term could be used to refer only to websites optimized for mobile use but nowadays most internet sites can be viewed with mobile devices. The key benefit the mobile internet provides is access to information and services anywhere and anytime.

Mobile service is a service intended to (mainly) be used by some mobile device – typically mobile phone. The service can include a piece of software to be installed on the phone or the whole service can be used over the internet.

Web 2.0 is a not a technological update of the internet, it's a phenomenon relating to user creativity, information sharing, and collaboration among users of the internet.

Mobile Social Media contains all kind of web 2.0 related services modified to be used with mobile phones. Through mobile social media services one or more individuals can communicate and connect with each another using the mobile phone.

WAP (Wireless Application Protocol) is a standard to access the internet through a mobile phone. Websites written with WAP-specific wireless markup language (WML) and optimized for mobile use are accessed via the WAP browser of the phone.

GPRS (General Packet Radio Service) is an enhancement for second generation mobile networks that speeds up the network and increases network capacity. GPRS improves for example WAP use.

EDGE (Enhanced Data for Gsm Evolution) is an enhancement technology to GPRS that allows increased data transmission rates and improved data transmission reliability. EDGE enables many mobile services to be used also with mobile phones not supporting 3G.

3G is a common abbreviation to third generation mobile technologies that enables fast data connections and thus transfers of pictures, music, video and other data.

WLAN and **WiFi** both refer to the wireless local area networks available in many public places, offices and also at home, often free of charge. The WLAN access points are typically connected to wired broadband connections.

WiMAX (Worldwide Interoperability for Microwave Access) is a technology aimed at providing wireless broadband data connections over long distances.

Ubiquitous computing refers to the use of different technical devices in the course of ordinary activities. Some say (especially location based) mobile services are the first step of ubiquitous computing.

3 Mobile internet and mobile services

In this study mobile services are defined as internet services used on mobile phones or other mobile devices. Mobile services can be accessed ubiquitously on the move through wireless networks with various devices. In addition the services under study are mostly targeted to consumers, not necessarily to business users or organizations. In the consumer business and consumers services, mobility basically means more seamless service access (Mallat et al. 2008). For example, the user can check email anywhere any time without the need to find a computer and/or WLAN access point.

Mobile Internet has the capability of providing access to information and services anywhere and anytime (Kaasinen 2005). Access to internet can be made through 2G or 3G mobile networks as well as through WLAN or WiMAX networks.

Mobile phones were originally used only to calling and later to send/receive short messages (SMS). In addition, internet access with mobile phone (or other mobile device) has been available for quite a many years. Already the second generation (2G) mobile networks, in Finland GSM (Global System for Mobile Communication), and devices enabled the use of specially designed mobile services through WAP-technology (Wireless Application Protocol), which was the first attempt in Europe to provide mark-up language based services on the mobile phone. However, in spite of the great buildup for these services, service providers were unable to create a critical mass of users, partly because the protocol was designed mainly considering business users' needs (Funk 2007). Saarinen et al. (2003) wrote that WAP failure factors included complicated pricing, lack of services and unreasonable customer expectations (WAP not really provided "internet in your phone" although it was promised when marketing this new technology). To many, poor features of WAP and the burst of the technology bubble in early 2000 have led to a skeptic approach towards mobile internet and mobile services in general.

Before (and besides) the introduction of third generation (3G) networks, 2.5G systems such as GPRS (General Packet Radio System) was introduced. 2.5G systems introduced the "always-on" notion of communications, and also introduced charging per amount of transferred data instead of used time. The data-amount-based charging however was not

predictable for the users as the user couldn't know in advance the amount of data some transaction in the web needed. When it comes to pricing information, customers want control and simplicity – a simplified pricing plan with no hidden costs or contracts, as well as pricing consistency between platforms. (Janelli & Oviedo 2008).

Third generation networks have finally made possible relatively high speed data connections that enable the users to even stream videos or music on their handset. Adoption of these broadband-speed networks may change patterns in the ways computers and mobile devices are used (Sawyer et al. 2003). During the last six months the carriers have introduced fixed monthly payments, which allow the user to use the data connection over the 3G network as much as she wants.

In addition to mobile networks provided by different telecom operators, many mobile devices can nowadays connect to WLAN (Wireless local area network) hotspots available on many public places. WLAN offers fast and reliable connection to the internet, often without any cost. The WLAN networks provide the user only "semi-mobility", as Sawyer et al. (2003) put it, as their reach and cover is not comprehensive and the user must connect to each hotspot separately.

As capabilities of networks and mobile devices have improved, mobile Internet can no longer be distinctively separated from the Internet as such. Some might go even further and say that mobile internet is the new internet, meaning that in the near future, much of internet use will be conducted with mobile devices, ubiquitously. However the user experience is not yet in demanded level: a user should be able to experience the same sort of simplicity and ease of use with the mobile Internet as they do at home, accessing the Internet from their PC.

Contextual factors affect consumer choice and selection criteria of mobile services depending on when, where and which services are used. (Mallat et al. 2008). For example location based mobile services can give the user quick access to the information or services that she needs in her current location and context of use (Kaasinen 2005).

4 Social media and mobile social media

"It is acknowledged that the 24-hour 365-day always-on nature of the mobile Internet will add further social and collaborative values for Web 2.0-like services in the mobile Internet deployment" (Yamakami, 2007).

One important trend in the communications world today is that customers are not simply consuming content. They are creating and sharing it as well, establishing communities based on mutual digital interests (Janelli & Oviedo 2008). Online communities like MySpace, Facebook and Flickr have been the biggest success stories in the web during the last few years. They have offered the users a way to express themselves, communicate with each other, make new friends and share content like music, pictures and videos. All this is nowadays also possible with a mobile phone.

The mobile social media is however still in its infancy – there is no social portal like MySpace or Facebook or other social environments in the mobile online world. Although e.g. Facebook has a dedicated user interface for mobile users, the services aren't designed and tailored to meet the requirements of mobile use. In fact, the mobile versions are quite limited in the functions they provide: for example a user can't just upload a picture, which she took with her camera phone, directly to Facebook or Flickr. Instead she needs to send it by email and add tags to the photo with special (non-self-evident) way.

One example of an early adopter of the idea of mobile social communities is SK Telecom in South Korea. Its CyWorld -community has more than 18 million customers, which is about 40 percent of the country's population (Janelli & Oviedo 2008). In this Facebook-like service the youth, businesspeople, celebrities and politicians alike set up their own homepages, called "Minihompy" (mini-homepage), with information, blogs, photos, items for sale and much more. The site already has more than 20 million unique visitors per month, and more than 90 percent of South Koreans in their 20s use the service (Techcrunch 27.7.2006). Most astonishing fact about the service is however the amount of mobile usage it draws. It has been claimed that each user of the service visits it in average 11 times a day writing messages to their friends and sending pictures taken by mobile phone (Korean Insight 14.11.2007.) (For US version of CyWorld, see http://us.cyworld.com/)

Mobile social communities (or at least mobile access to existing ones) seem to hit the western world in the near future as well. According to a blog post in GigaOM (GigaOM.com 1.6.2007) CyWorld had plans to introduce their mobile version in the US as well, but not much have been heard since. More importantly, Facebook has recently taken actions regarding the mobile market. Its recent introduction of the 'Facebook for Mobile Operators' platform in Western Europe was followed with an agreement with Vodafone, the European largest carrier (Mashable.com 7.2.2008). At the same time the company reported 6 million mobile members worldwide, in comparison with 64 million online subscribers (Analysys Research 28.2.2008). Also some deep co-operation between Facebook and phone manufacturer Nokia is rumored (Taloussanomat 21.1.2008)

In most cases, the growth of mobile social networks is being limited by 1) poor user interfaces, 2) high participation costs (e.g. data transfer fees) and 3) the limited content available in comparison with established online networks (Analysys Research 28.2.2008). New mobile phones with better displays, cameras and e.g. geo-tagging (with built-in GPS) capabilities definitely bring new possibilities in this area as well.

5 Theories of innovation diffusion, behavior and technology adoption

The theory part of the study covers the literature review to the subject. References consist of scientific articles from journals and Masters / Doctoral Theses. Articles from newspapers, websites or blogs as well as some statistical information are used as a background material. After the literature review, a framework for the study is presented which is then followed by description and findings of the empirical study.

The best-known theories and models used for technology adoption include Theory of Reasoned Action (TRA) (Ajzen & Fishbein 1980), Theory of Planned Behavior (TPB) (Ajzen 1991), Social Cognitive Theory (SCT) (Bandura 1986), Diffusion of Innovations theory (Rogers 2003), Technology Acceptance Model (TAM) (Davis 1989), TAM2 (Venkatesh & Davis 2000), Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, et al. 2003) and Decomposed Theory of Planned Behavior (DTPB) (Taylor & Todd 1995).

Theoretical framework of this study consists of a model based on the Theory of Reasoned Action (TRA), Diffusion of innovations theory and different theories of (mobile) technology and mobile services adoption and approval. Seminal theories such as Theory of planned behavior (TRA) (Ajzen & Fishbein 1980), Diffusion of innovations theory by Rogers (2003) and Technology acceptance model (TAM) (Davis 1989) are used as a base for the framework. These are all widely tested theories and all of them have been used in earlier studies concerning adoption of mobile technology or services. For example TAM is one of the most widely used theories concerning end user behavior and system usage (Chen et al. 2002). Further, according to Pedersen (2005) TAM, TRA and theory of planned behavior (TPB), three related models, stand out as most widely applied adoption theories.

The goal is to create a framework, modeling different beliefs that affect the willingness to adopt new mobile services, as a base to the empirical study concerning the adoption of different kinds of services.

Acceptance models limitations

TRA, TAM and other acceptance models are limited, because they assume that a decision made by individual is not affected by external factors (i.e. they take into account the social pressure but not use context). Mallat et al. (2008) presented in their model a variable "use context" to describe the relation of the behavior and the environment within which it takes place. In this study however use context is left out as the services under interest are really different and the effect of use context would be hard to measure.

Also, little is said about post-adoption behavior (or re-adoption) after the use behavior. The different effects of initial adoption and post-adoption behavior have been studied by e.g. Karahanna et al. (1999).

Many applications of TAM and its derivatives have been made in organizational contexts. Hence it is questionable if they should be used in non-organizational contexts (Carlsson et al. 2005). However, in contrary to business use of mobile services, the consumer's usage of m-services is completely voluntary, lacks organizational support and the target group consists of a large number of people with very diverse backgrounds (Wang et al. 2006). Thus the variables affecting intentions to adopt consumer services may differ from those studied in organizations.

5.1 Diffusion of Innovations

Diffusion of innovations theory presented by Rogers is a multidisciplinary theory used widely also in information systems adoption research. It has also been successfully used to predict the adaptation of mobile commerce and services (Mallat et al. 2008). Diffusion is defined as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers 2003:5).

The theory defines five characteristics which affect the rate of adoption of an innovation: 1) relative advantage, 2) complexity, 3) compatibility, 4) trialability, and 5) observability.

1) Relative advantage is the degree to which an innovation can bring benefits to the user. (*Ratio of the expected benefits and the costs of adoption of an innovation)*
2) Compatibility is the degree to which an innovation is perceived as consistent with existing values, past experiences and needs
3) Complexity is the degree to which an innovation is perceived as difficult to understand and use
4) Observability is the degree to which the results of an innovation are visible to others
5) Trialability, the degree to which an innovation may be experimented with. A personal trial can dispel uncertainty about the new innovation.

Previous studies suggest that especially three of the innovation characteristics: relative advantage, ease of use and compatibility, determine the adoption of IS systems (Tornatzky, & Klein 1982). This makes sense, since the two others, observability and trialability, are more related to learning mechanisms associated to the innovation.

Diffusion of innovations theory also determines the process how an individual makes adoption decisions:

Innovation decision process:

- 1) Knowledge – person becomes aware of an innovation and has some idea of how it functions but lacks still complete information about it,
- 2) Persuasion – person forms a favorable or unfavorable attitude toward the innovation,
- 3) Decision – person engages in activities that lead to a choice to adopt or reject the innovation,
- 4) Implementation – person puts an innovation into use,
- 5) Confirmation – person evaluates the results of an innovation-decision already made.

Rogers (2003:281) has recognized five different adopter categories, to which different persons can be placed according to their individual characteristics and on the basis of when they adopt a new idea. These adopter groups are: 1) innovators, 2) early adopters, 3) early majority, 4) late majority, and 5) laggards. Each of the adopter groups consists of individual with a similar degree of innovativeness (Rogers 2003:267). Categories follow a standard

deviation-curve: very little innovators (2,5%) adopt the innovation in the beginning, early adopters making up for 13,5% a short time later, the early majority 34%, the late majority 34% and after some time finally the laggards make up for 16%. Generally it can be said that innovativeness as such primarily represents different communication behavior between individuals.

In a wider scale the diffusion of an innovation follows an S-curve. Innovations spread through society in an S-curve, as the early adopters select the technology first, followed by the majority, until a technology or innovation is common. The explanation for this phenomenon can be found from different impacts of different information channels and communication mechanisms. The first adopters can't rely on information from their peers and they have to get the information about the advantages the new innovation brings from media or by trial. As the diffusion process proceeds however, knowledge about the innovation is more widely available and social communication is emphasized (Rogers 2003:274). According to diffusion theory, since opinion leaders directly affect the tipping of an innovation, a powerful way to change attitudes towards an innovation is to affect opinion leader attitudes.

One of the biggest obstacles for diffusion of 3G-services is the difficulty of beginning to use them alongside with poor compatibility with already existing devices (Hartikainen 2007). However especially the young who have lived practically their whole life with mobile devices can be early adopters concerning the mobile use of web services. According to a study conducted in Japan, affluent youth is the core segment in mobile internet adoption (Okazaki 2006).

The Diffusion of Innovations model has been developed further by Moore & Benbasat (1991), who introduced a measurement instrument named ***Perceived Characteristics of Innovation (PCI)***, which was designed especially for studying IS adoption. The theory includes eight attributes that affect adoption of innovations: 1) relative advantage, 2) complexity, 3) compatibility, 4) result demonstrability, 5) voluntariness, 6) image, 7) trialability and 8) visibility.

5.2 Social sciences approach

5.2.1 Theory of reasoned action – TRA (Ajzen and Fishbein 1980)

The Theory of reasoned action, rooted in social psychology research, is a theory by Ajzen and Fishbein (1980). It states that individual behavior is driven by behavioral intentions where behavioral intentions are a function of an individual's attitude toward the behavior and subjective norms surrounding the performance of the behavior. TRA is a common theory for predicting human behavior, thus it is not intended particularly to adoption of some technology. However it forms the base for most of the studies associated with attitude-behavioral relationships.

TRA model includes four basic concepts: 1) Attitude toward act of behavior (behavioral attitudes), 2) Subjective norm (normative pressure), 3) Behavioral intention (towards the usage), and 4) Behavior (actual usage).

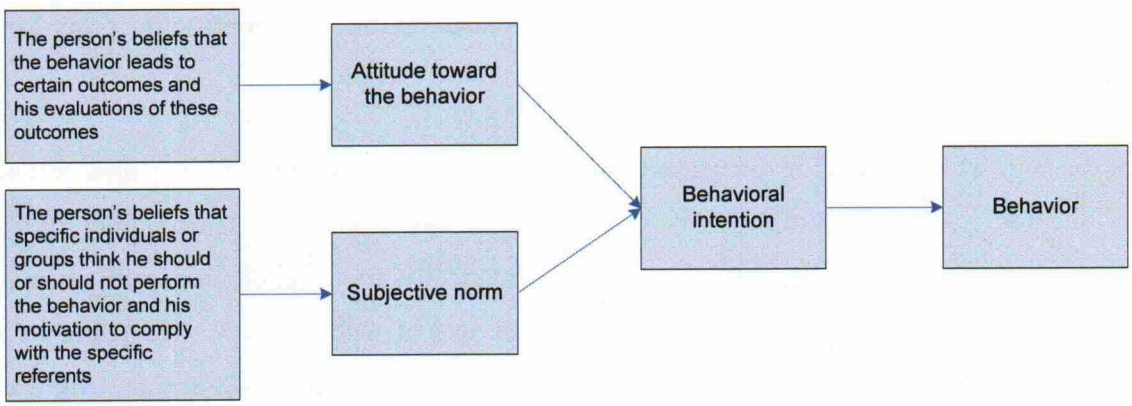

Figure 1: Theory of reasoned action (Ajzen & Fishbein 1980)

Figure 1 illustrates how attitude and subjective norm affect the intention towards the behavior which is the immediate antecedent of behavior leading to behavior. Intention is the cognitive representation of a person's readiness to perform the given behavior.

Most social behaviors are under volitional control and thus are predictable from intentions (Ajzen & Fishbein 1980:5). Hence most behaviors can be predicted with right kind of measurements which take into account person's intention to behave.

The personal factor (attitude toward act of behavior) in the model is the individual's positive or negative evaluation of performing the behavior. The second determinant of intention is

the person's perception of the social pressures put on him to perform (or not to perform) the behavior in question. (Ajzen & Fishbein 1980: 6)

According to TRA, attitude is a function of beliefs. Behavioral beliefs underlie a person's attitude toward the behavior. If a person believes that performing the action in question would lead to positive outcomes, he will have positive attitude towards the action and vise versa. In addition, normative beliefs underlie a person's subjective norm. Normative beliefs refer to the person's perception of how people close to him think he should act considering the decision on hand.

The theory assumes that in general intention is the immediate determinant of behavior, and that when an appropriate measure of intention is obtained it will provide most accurate prediction of behavior (Ajzen & Fishbein 1980:41). The authors of the theory however point out that this doesn't mean that a measure of intention will always be an accurate predictor of behavior (1980:42).

It has to be taken into account that measures of intention aren't always good predictors of behavior. Intentions can change over time and a measure of intention taken before some observation of behavior may differ from the intention at the time of that observation (1980: 47). Intentions can change over time for many reasons such as sudden illness, injury, natural disasters, change of others behavior or acquirement of new information (1980:48).

In my study the behavior of students is measured on individual level and then analyzed in aggregate level. "The distinction between predicting behavior at the level of individual and at the aggregate level is important because aggregate intentions are apt to be much more stable over time than are individual intentions" (1980: 48). In aggregate level the individuals' changes of beliefs and intentions are likely to balance out leading to relatively stable intentions. (1980: 48). Hence the variances between different individual services should be to some extent balanced in the analysis in aggregate level.

The creators of TRA don't say much about the beliefs affecting attitudes (and thus adoption), but they point out that the beliefs should be fitted to the phenomenon under interest. Also, they argue that behavioral criteria comprise of four different elements: the action, the target at which the action is directed, the context in which it occurs, and the time at which it is performed (Ajzen & Fishbein 1980:39).

Sheppard et al. (1988) listed some shortcomings of TRA. According to them, one problem is that the theory focuses on behavior but not goal achievement. Use of TRA is impossible if the performance of some action requires knowledge, skills, resources, or others' co-operation, necessitates overcoming environmental obstacles, or if there are external factors limiting the person's decision making (for example you can't buy a house even if you intended if you can't get a mortgage from the bank).

5.2.2 *Theory of planned behavior TPB (Ajzen 1991)*

Theory of planned behavior (Ajzen 1991) is revised version of TRA. TPB extends TRA and introduces a new constraint, perceived behavioral control, which is defined as one's perception of the difficulty of performing a behavior. The addition of this new constraint was necessary because of the original model's limitations in dealing with behaviors over which people have incomplete volitional control (Ajzen 1991). As TRA, TPB assumes that intention is a good predictor of behavior and that stronger intention leads to behavior more likely. However, behavioral intention can confidently find expression in behavior only if the behavior in question is under volitional control (Ajzen 1991). This is always not the case as performance of most behaviors depends at least to some degree on such non-motivational factors as availability of requisite opportunities and resources (e.g. time, money, skills, and co-operation of others).

For example, According to TPB, when considering the use of mobile services, a user who has used mobile services before is more likely to adopt such services than his peer with similar intention to adopt because the grater behavioral control of the more experienced one over the situation influences both intention but also to some extent directly the behavior.

In my research model the resources (e.g. financial resources and skills: perceived ease of use) are included in the constraints affecting attitude towards the behavior.

5.2.3 *Social cognitive theory (Bandura 1986)*

Social cognitive theory (SCT) is helpful for understanding and predicting both individual and group behavior and identifying methods in which behavior can be modified or changed. The theory argues that human functioning should be viewed as the product of a dynamic interplay of personal, behavior, and environmental influences (Bandura 1986). The theory emphasizes that cognition plays a critical role in people's capability to construct reality and perform different behaviors.

Three concepts of the theory are in a reciprocal relationship with each other, as displayed in Figure 2.

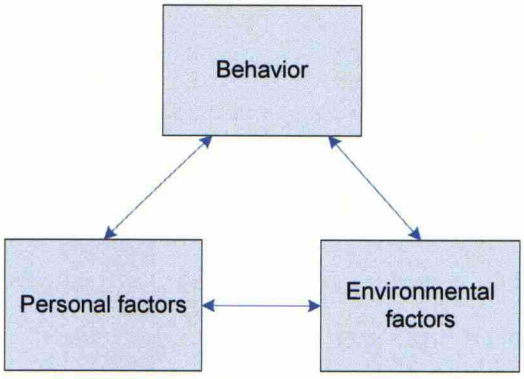

Figure 2: Social cognitive theory (Bandura 1986)

Social cognitive theory relates also to Diffusion of Innovations theory as both theories seek to explain how individuals change their behavior as a result of communication with other individuals (Rogers 2003:342).

5.3 Uses and gratifications research

Most studies of technology adoption have been made in organizational context. When studying consumers' intentions to use mobile services in the context of everyday life, the information systems perspective must be supplemented by other theories that encompass both non-utilitarian motives and utilitarian motives for use (Nysveen et al. 2005).

The uses and gratifications research has its foundation in communications research, which integrates research from the field of media, sociology and social psychology (Katz and Blumler 1974). It is a media use paradigm useful for diagnosing user motivations for technology usage.

The uses and gratifications theory argues that psychological needs shape an audiences' adoption of the media. The basic idea is that people use a media to get specific gratifications, take an active part in the communication process and are goal oriented in their media use. Thus the key question is: why do people use communication devices and the information they provide, what purposes do they serve? The theory is grounded on three main tenets: media adopters are 1) goal-directed, 2) active media-users and 3) aware of their needs (Okazaki 2006).

Okazaki (2006) used this theory when examining the relationship between consumer's attitudes and their demographic characteristics. He categorized mobile internet users according to the degree to which they spontaneously perceive the medium to be irritating, informative, or entertaining – characteristics which have been identified as principal motivations in earlier studies of wired Internet service adoption. In addition, Nysveen et al. (2005) proposed based on uses and gratification research that enjoyment, fun seeking, and entertainment are significant motivations for using mobile services and should be included in the adoption models. Also Shin (2007) found statistical evidence that perceived enjoyment is an antecedent for attitude.

5.4 Traditional technology acceptance models

In the field of IS research, many models for technology adoption with different sets of adoption determinants are used. Many of them focus on individual acceptance of technology by using intention and/or usage as the key dependent variable. (Venkatesh et al. 2003). The main objective of these studies is to investigate how to promote usage and also to find out what factors are hindering usage and intentions to use the technology at question. All of these studies have to some extent different premises and benefits (Kripanont 2007) but they all share the same underlying concept (Venkatesh et al. 2003).

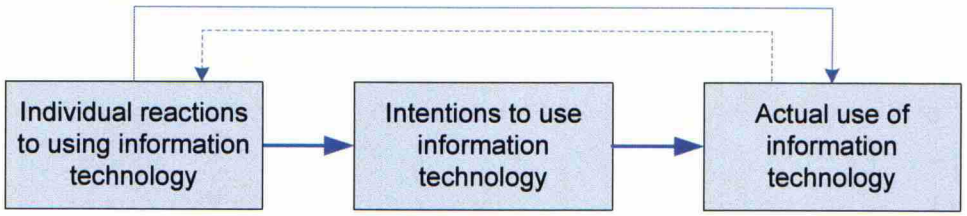

Figure 3: Basic concept underlying user acceptance models (Venkatesh et al. 2003)

As my study continues the tradition of these models, it is good to first go through the central theories and models based on this basic concept. These are Technology acceptance model (TAM), TAM2 and Unified theory of Acceptance and Use of technology (UTAUT). I also discuss Decomposed Theory of Planned Behavior; a theory combining characteristics of Diffusion of Innovations, TAM and TPB.

5.4.1 Technology acceptance model TAM (Davis 1989)

Technology acceptance model (Davis 1989) was developed to predict end-user acceptance of information systems within organizations. The goal was to create a simple and general model tailored for adoption of technology and information systems.

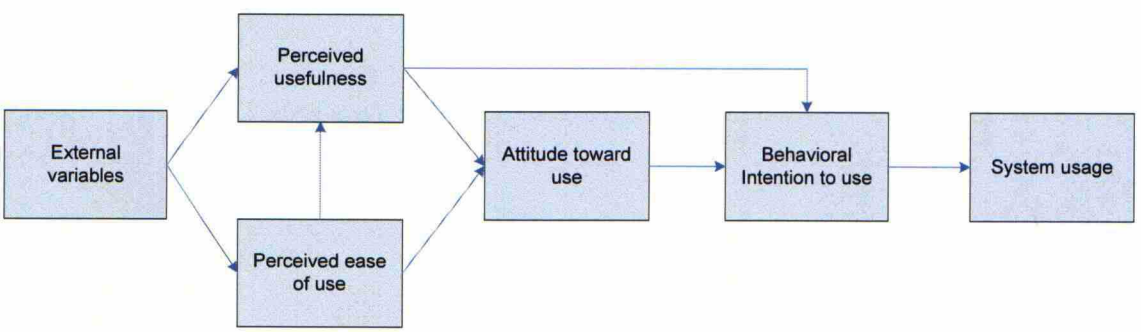

Figure 4: 5.4.1 Technology acceptance model TAM (Davis 1989)

TAM is based on the theory of reasoned action (TRA, see chapter 5.2.1) and it presents a model where TRA's attitude measures are replaced with two beliefs, perceived ease of use and perceived usefulness, as the primary predictors of use intentions. These two beliefs then determine the attitude toward using a system and attitude, together with perceived usefulness, determines use intention which finally predicts the actual system use. Perceived usefulness is also directly impacted by perceived ease of use.

The subjective norm measure of TRA is not present at all in TAM, so the use decision is assumed to be affected only through the user's judgment of utilitarian factors such as usefulness and the effort needed to adopt the technology (perceived ease of use). However according to research of Venkatesh et al. (2003) social influences do matter in acceptance decisions and should be included in the acceptance models.

TAM has been long a dominant model in information systems adoption research and it has been successfully applied to different domains of mobile commerce research as well (e.g. Mallat et al. 2008; Wang et al. 2006, Kaasinen 2005, Nysveen et al. 2005, Pedersen 2005).

5.4.2 TAM2 (Venkatesh & Davis 2000)

TAM2 extends TAM by including subjective norm of TRA (which was missing from the original TAM model) as an additional predictor of intention in the case of mandatory settings (Venkatesh & Davis 2000)

Attitude is no longer presented in this model but perceived usefulness, perceived ease of use and subjective norm are direct determinants of behavioral intention to use. Perceived usefulness is determined by 5 factors: Subjective norm, Image, Job relevance, Output quality and result demonstrability.

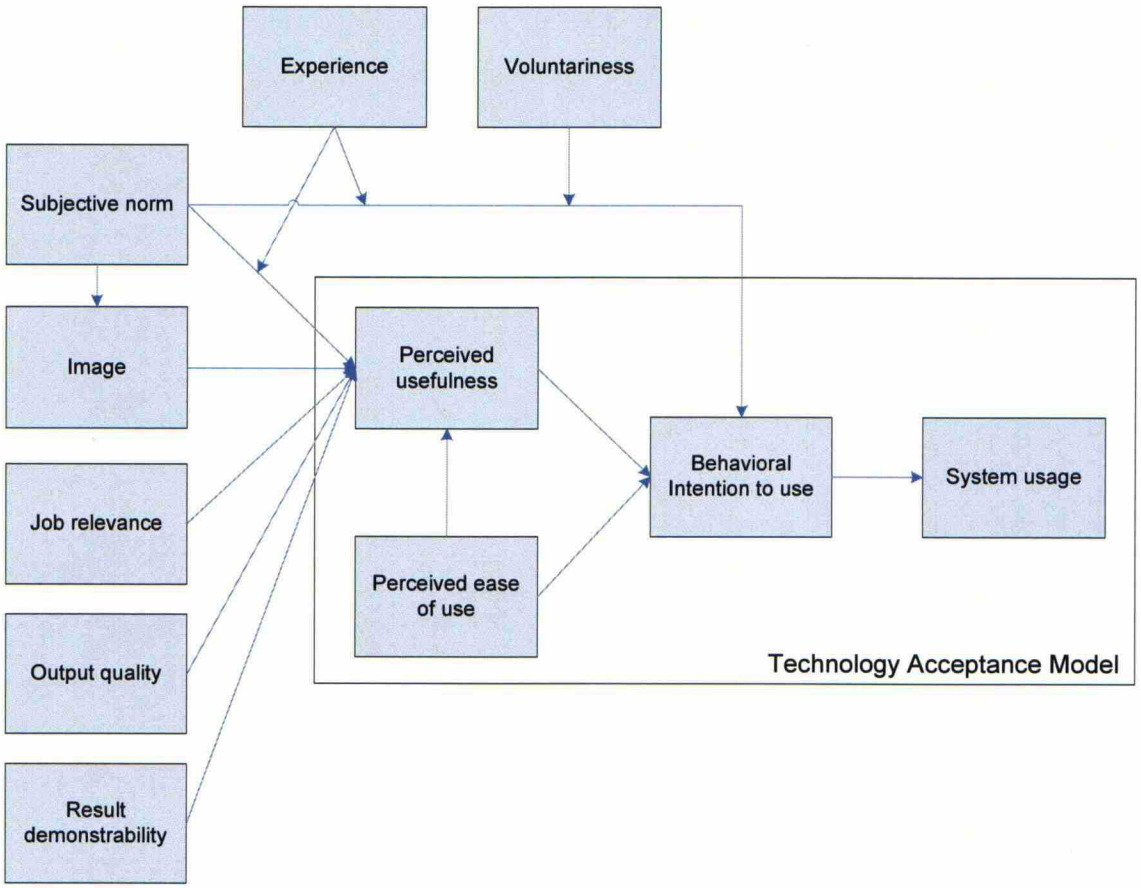

Figure 5: TAM2 (Venkatesh & Davis 2000)

Venkatesh and Davis (2000) tested TAM2 using longitudinal data collected regarding four different systems at four organizations, two involving voluntary and two involving mandatory usage. They conducted both pre-implementation and post-implementation measurement to the constructs. The model managed to explain 34 to 52 per cent of the variance in use intentions. Both social influence processes (subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and perceived ease of use) of the model influenced significantly user acceptance of technology under study (Venkatesh & Davis 2000).

5.4.3 *Unified Theory of Acceptance and Use of Technology UTAUT (Venkatesh et al 2003)*

Unified theory of acceptance and use of technology by Venkatesh et al. (2003) combines constructs of eight models from earlier research (theory of reasoned action, technology acceptance model, motivational model, theory of planned behavior, a combined theory of

planned behavior/technology acceptance model, model of PC utilization, innovation diffusion theory, and social cognitive theory). The theory posits three direct determinants of intention to use (performance expectancy, effort expectancy, and social influence) and two direct determinants of usage behavior (intention and facilitating conditions). In addition, the model presents moderating influences of experience, voluntariness of use, gender, and age (Venkatesh et. al. 2003).

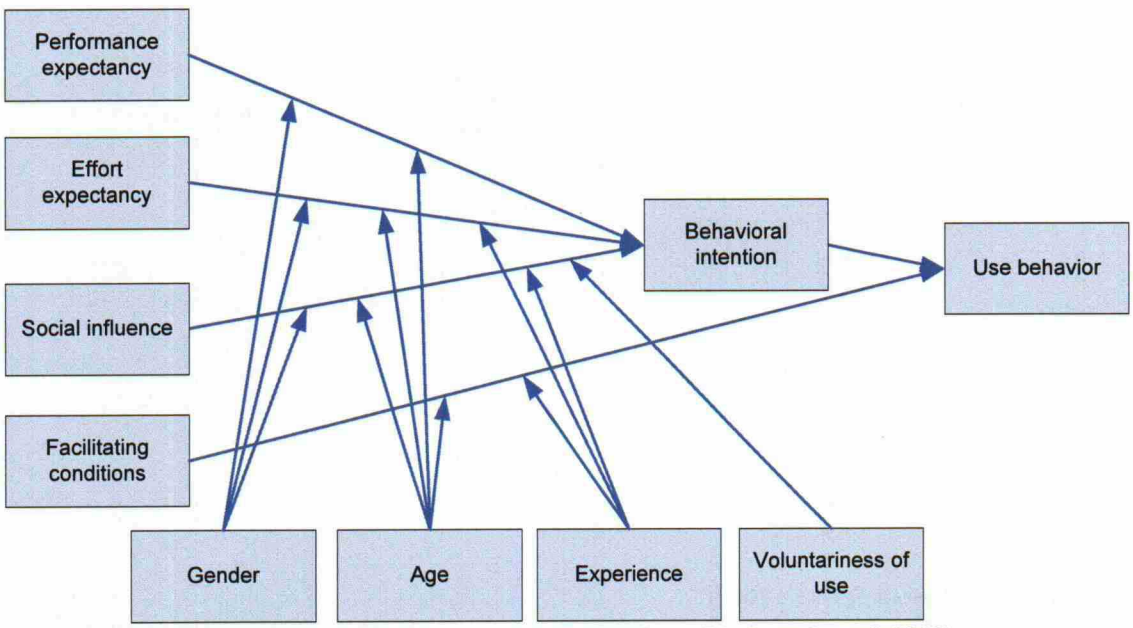

Figure 6: Unified theory of acceptance and use of technology (Venkatesh et al. 2003)

According to their longitudinal study of four organizations the model explained 70 % of the variance in use intentions as the underlying individual models explained only 17 to 53 percent of the variance.

5.4.4 Decomposed Theory of Planned Behavior (Taylor & Todd 1995)

The Decomposed Theory of Planned Behavior (Taylor & Todd 1995) contains attitude, subjective norm and behavioral control introduced in TPB. These three constructs are decomposed into specific dimensions.

Attitude is affected by three beliefs: perceived ease of use, perceived usefulness (both presented in TAM) and compatibility. Subjective norm includes normative beliefs and takes into account the influences of peers and the superior of the individual, two groups that may be expected to have different influences (Taylor & Todd 1995). Perceived behavioral control

contains three beliefs: self efficacy, resource facilitating conditions and technology facilitating conditions.

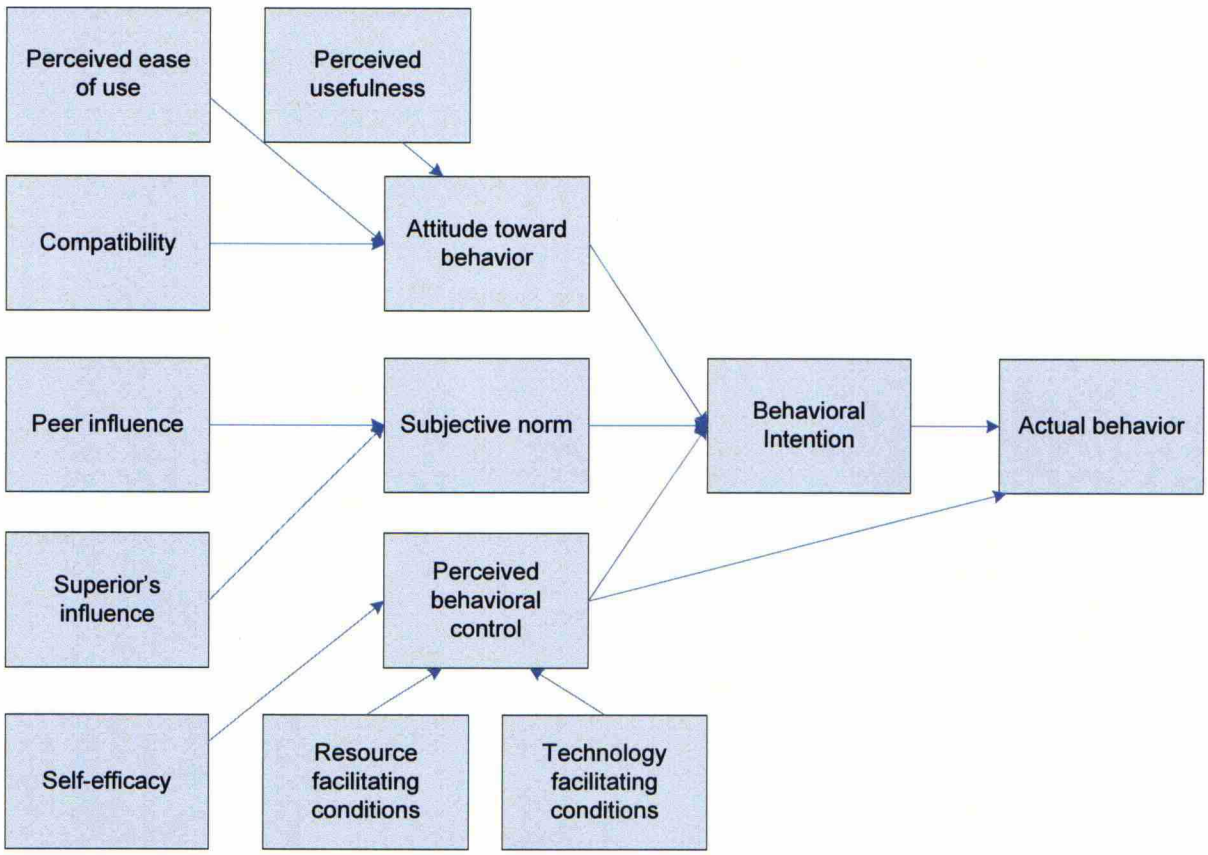

Figure 7: Decomposed Theory of Planned Behavior (Taylor & Todd 1995)

5.5 Mobile services adoption models

In this subchapter I discuss some earlier models for adoption of mobile services. Researchers have approached the problem of mobile technology adoption from two different angles; others (e.g. Luarn & Lin 2005) have studied some particular service and factors affecting the use and intention to use that service. Others (e.g. Kaasinen 2005) have tried to create a unified theory that could model factors affecting acceptance of any mobile service.

5.5.1 *Acceptance model for mobile banking (Luarn & Lin 2005)*

One example of a study concentrating on one service only is the study of Luarn & Lin's (2005) study about acceptance of mobile banking. Based on data from 180 mobile banking users they created a model that extends the applicability of TAM and TPB in a mobile banking context by adding one trust-based construct, perceived credibility, and two resource-based constructs, perceived self-efficacy and perceived financial cost, to the model.

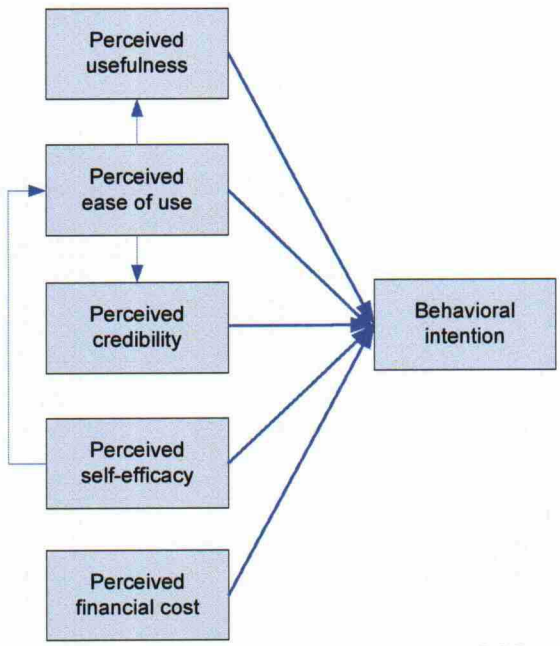

Figure 8: Luarn & Lin (2005) acceptance model for mobile banking

Luarn & Lin's (2005) model fitted well in mobile banking environment as the R square of the model was as high as 82 %. The study proved that ease of use and high usefulness of the service aren't maybe enough to lure users for a mobile service. Perceived credibility construct was an important addition to the model as security and privacy issues were found to be a significant concern for consumers when using mobile banking. Also perceived financial cost was found to be a significant barrier preventing usage of mobile banking (Luarn & Lin 2005).

Luarn & Lin (2005) also proved that perceived self-efficacy has a significant effect on perceived ease of use, which in turn has positive influences on perceived usefulness and perceived credibility as presented in the model (Figure 8).

5.5.2 *Integrated model for predicting consumer intention to use m-service (Wang et al. 2006)*

Wang et al. (2006) developed Luarn & Lin's (2005) model for adoption of mobile banking even further with a model for predicting consumer intention to use m-service. The goal of their study was to build an integrated model for predicting consumer intention to use mobile services. They maintained the three new constructs: perceived credibility, self efficacy and perceived financial resources. In addition three new construct relationships were introduced.

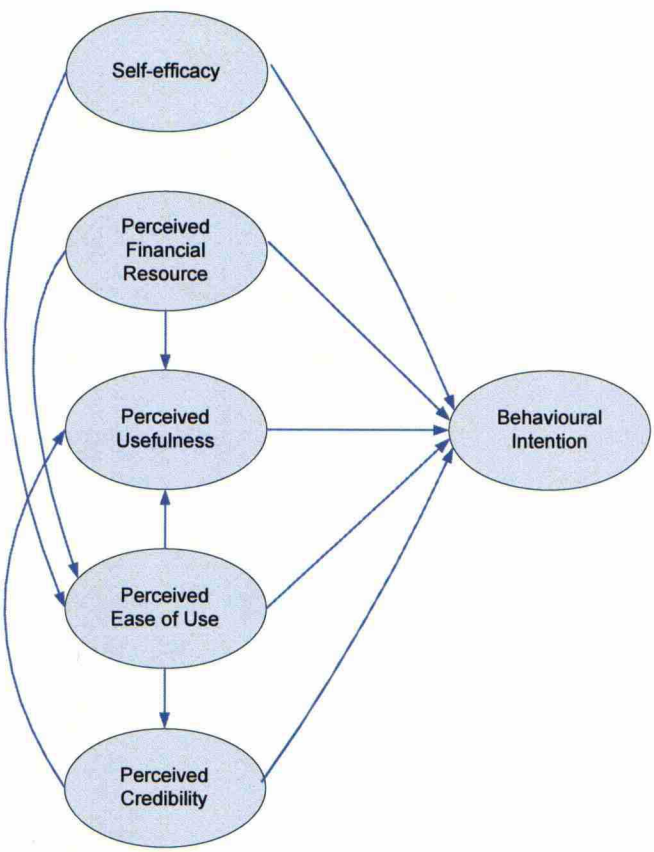

Figure 9: Wang et al. (2006) model for predicting consumer intention to use m-service.

In the model perceived financial resource, perceived credibility and perceived ease of use influence the behavioral intention, either directly or indirectly through their effect on perceived usefulness. Self-efficacy also influences behavioral intention indirectly through its effect on perceived ease of use.

Wang et al (2006) compared their model's predictive power to TAM and found out that their model for predicting consumer intention to use m-service is significantly better than simpler models such as TAM. They also point out that investigation of m-service acceptance in general is relatively new to IS research and that more research on the area is needed to

generalize their findings to additional groups and technologies. Further, they also suggest that in further studies their model could be complemented with factors such as social influence and perceived playfulness.

5.5.3 *Nysveen et al. (2005) acceptance model for mobile services*

Nysveen et al. (2005) presented a model combining TAM and additional concepts from uses and gratifications research as well as domestication research. The biggest difference compared to other acceptance models is the introduction of 1) perceived expressiveness and 2) perceived enjoyment, which both describe the non-utilitarian gratifications related to usage of digital consumer services. In organizational context these characteristics don't have such influencal effect as most information systems are addressed to a user from a higher level.

Nysveen et al. (2005) argue that it is important to take into consideration untraditional antecedents of technology usage when studying intention to use mobile services. In the model expressiveness describes the "degree to which users of mobile services perceive the services as suitable for expressing their emotions and social or personal identity" (Nysveen et al. 2005) Enjoyment, on the other hand, is after Igbaria et al. (1996:129) "the intrinsic reward derived through the use of technology or service".

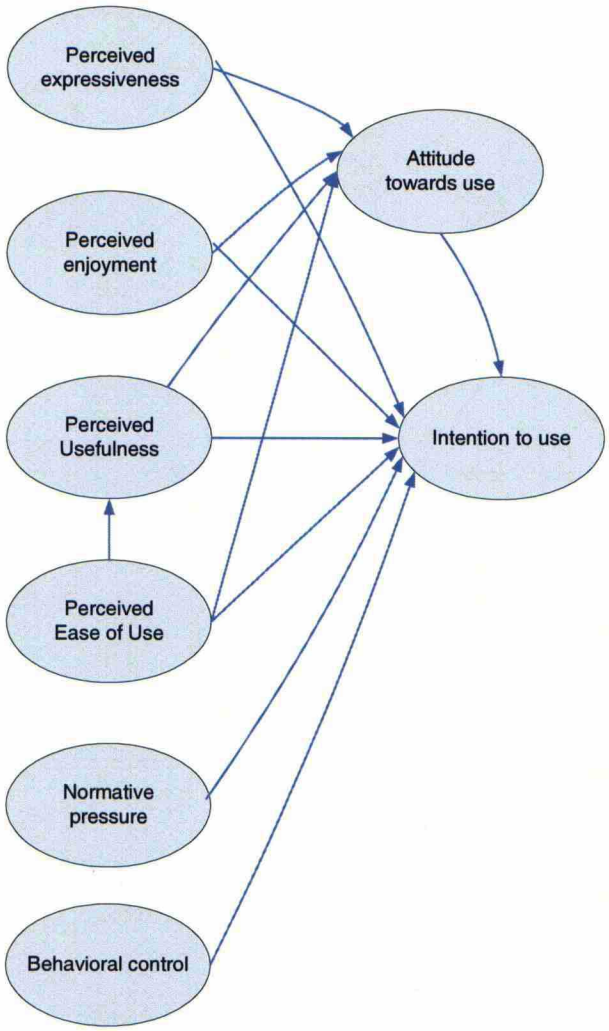

Figure 10: Acceptance model for mobile services (Nysveen et al. 2005)

5.5.4 Pedersen's (2005) model for mobile commerce adoption among early adopters

Pedersen (2005) studied adoption of mobile internet services among early adopters (or innovators, according to Rogers (2003)) of mobile commerce. He proposes a model extending TAM modified from decomposed theory of planned behavior (by Taylor and Todd 1995). Pedersen combines TPB and TAM and spices things up with measures adopted from domestication research. His model is an attempt to integrate domestication research findings into technology adoption models.

In his study the model explained 49% of the early adopters' intentions to use mobile commerce.

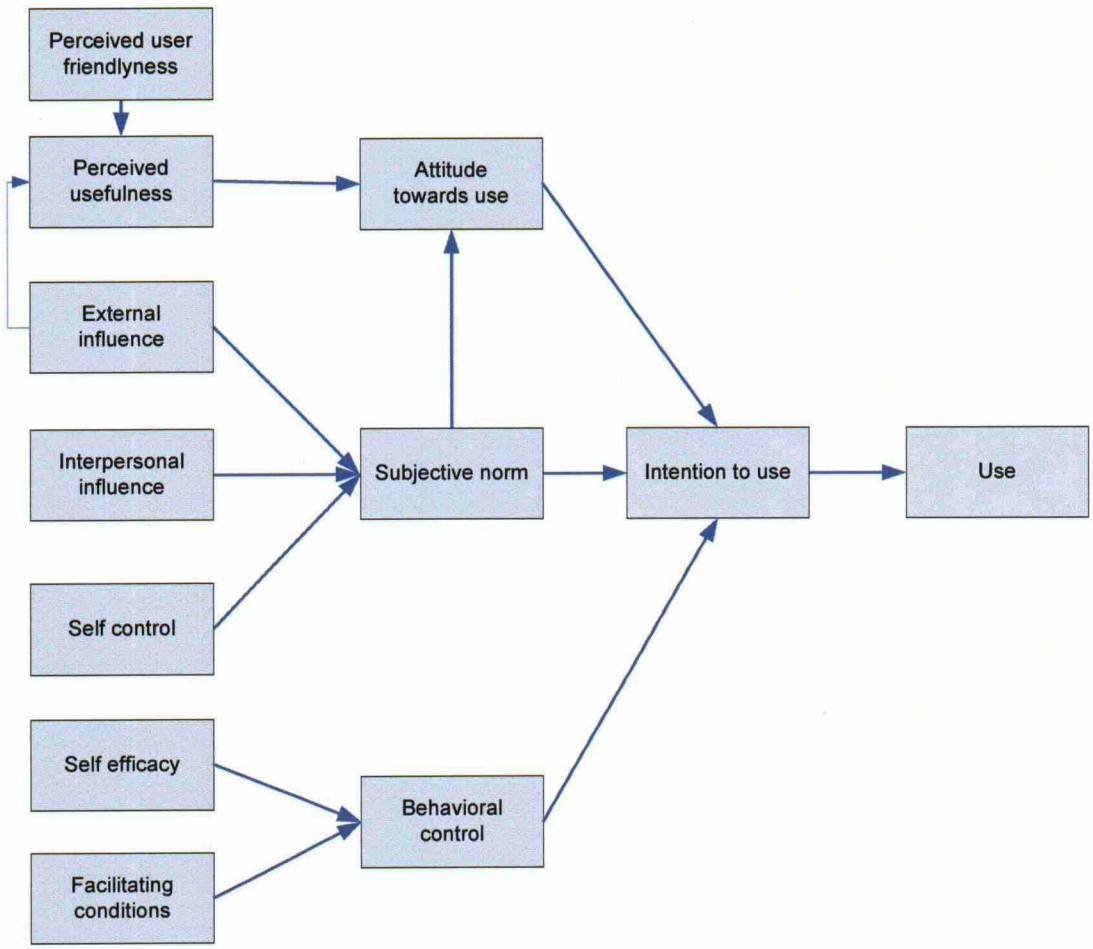

Figure 11: Pedersen (2005) model for mobile commerce adoption among early adopters

Pedersen (2005) articulates that there seems to be a lack of studies that have applied traditional ICT-adoption theory to the adoption of mobile services. He continues that his study proves that findings from domestication research can be used to extend (and modify) current adoption models.

Although Pedersen found support for traditional TAM measures he also stated that there is a need to extend TAM with behavioral control and subjective norm. Also TBP should be modified when studying mobile services (Pedersen 2005).

5.5.5 Technology Acceptance Model for Mobile Services (Kaasinen 2005)

The technology acceptance model for mobile services (Kaasinen 2005) is a modification and extension of the original Technology Acceptance Model by Davis (1989) and it identifies four factors that affect user acceptance of mobile services: perceived value to the user, perceived

ease of use, trust and perceived ease of adoption. The framework suggests that perceived ease of use, perceived value and trust affect the intention to use a mobile service.

One interesting factor in Kaasinen's (2005) model is the transition from intention to behavior. She points out that to get from an intention to use to real usage, the user has to take the service into use, which is a new phase between intention to use and usage behavior. This transition is affected by perceived ease of adoption, a new characteristic in acceptance model, introduced also by Kaasinen.

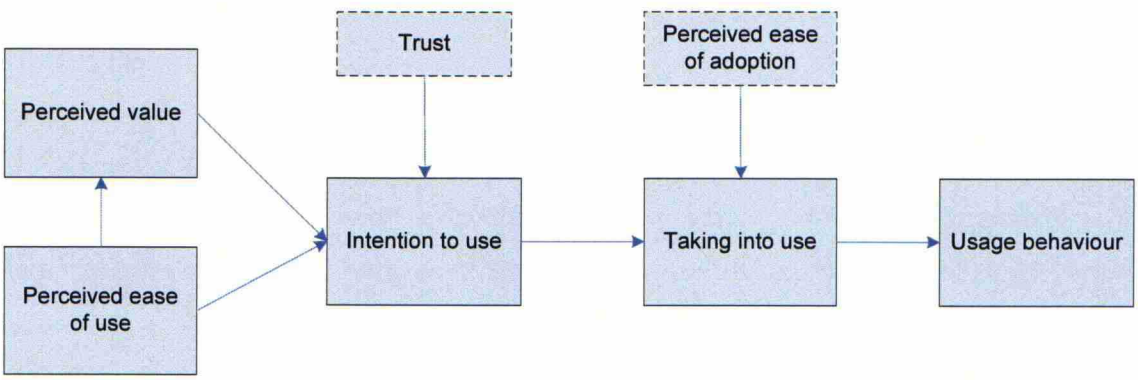

Figure 12: Technology Acceptance Model for Mobile Services (Kaasinen 2005)

6 Study Framework and hypotheses

The previous chapter of this study discussed many earlier studies of the research area. They form the theoretical background for the study framework. In this part of the study, the above discussion is synthesized and I introduce the framework based on some aspects of the mentioned earlier studies, describe the proposed integrative research model as a base for the empirical study and form the research hypotheses.

6.1 Framework

The research model proposed in this chapter is based on theory of reasoned action – TRA by Ajzen & Fishbein (1980). The model presented here is however extended to contain behavioral beliefs about adopting technology (adopted from previous studies), which affect the attitude towards use. Also, subjective norm is affected by social influence in the model. Both of these have been earlier suggested by Karahanna et al. (1999). Further, behavioral beliefs are affected by information which the adopter has gathered from various sources, which is in line with the Diffusion of Innovations theory.

6.1.1 Composing the research model

Because earlier studies in the field of information systems and mobile services, based widely on TRA, have already proven that attitude and social norm are significant predictors of intention and that intention is best predictor of behavior, there is no need to prove this again in this study (although the influence of attitude and social norm are tested as well). More important is to measure the effect of beliefs on attitudes and compare if the beliefs differ between the two research categories. In addition, the question of possible differences on effects of information sources as well as attitude and social norm is addressed.

Pedersen & Ling (2002) suggested that integration into a more comprehensive model of mobile service adoption could be done by modifying and extending traditional adoption models based on the findings from innovation diffusion, uses and gratifications and domestication research. This study is an attempt to form a model that draws together

characteristics affecting mobile service adoption from all these research traditions to form a more comprehensive model including variables from earlier studies as well as some new factors based on a pilot study.

The foundation of the research model is build on TRA and constructs such as use behavior, behavioral intention to use, subjective norm and attitude towards use come directly from that model. The beliefs that affect the attitude towards use are derived from earlier studies of the area. Next I will go through the different constructs in the research model to explain their origins.

Perceived ease of use has been present in almost all of the studies of mobile technology adoption (e.g. Kaasinen 2005, Wang et al. 2006, Mallat et al. 2008). According to Nysveen et al. (2005), user-friendliness of a service may increase consumers' intentions to use a mobile service even if they don't have a positive overall attitude towards the service itself.

Also perceived usefulness is present respectively (e.g. Pedersen 2005, Nysveen et al. 2008). However perceived usefulness in TAM and many earlier mobile acceptance models, relative advantage from Diffusion of innovations and attitude of TRA can all be seen as the user's evaluation of all perceived positive and negative effects the service/innovation has. The terms perceived usefulness, relative advantage and compatibility of an innovation have been used in many studies with many different (salient) meanings (Tornatzky and Klein 1982). Thus the term in its traditional shape felt too wide to be used in my model.

Perceived usefulness was originally defined by Davis (1989) as "the degree to which a person believes that using a particular system would enhance his or her job performance". Thus it can be said that perceived usefulness originally included mostly the benefits of increased efficiency gained after the adoption of new software. To give more distinctive name to this belief, I have in my model replaced the term "Perceived usefulness" with "Efficiency benefits" to describe all kind of improvement of efficiency in everyday situations. This decision was made based on my impression that in some of the technology adoption studies the usefulness belief has been used almost similarly as attitude in this study.

Kaasinen (2006) states in her study that "as the services will increasingly deal with personal data, the user's trust in the services will become an even more important user acceptance factor." This is definitely the case particularly in socially consumed mobile services. Thus

this construct is added to the model as one of the beliefs. Also Luarn & Lin (2005), Mallat et al. (2008) and Wang et al. (2006) have found support for constructs relating to risk or trust when studying the adoption of mobile services.

Compatibility and perceived ease of adoption are to some extent equivalent to perceived behavioral control. They measure how free of efforts an individual thinks the adoption of the service in hand is. Compatibility and perceived ease of adoption are present for example in the studies of Rogers (2003), Pedersen (2005) and Kaasinen (2005).

Nysveen et al. (2005) proposed that when studying consumers' intention to use mobile services in everyday life, the traditional information systems perspective (e.g. TAM) should be supplemented by other theories that provide constraints for nonutilitarian motives for use. They emphasize the importance of taking into consideration relatively untraditional antecedents of technology usage, such as perceived expressiveness and perceived enjoyment, two concepts adopted from domestication research (Ling 2001) and uses and gratification research. Thus to complement the model, two new factors, 1) perceived enjoyment and 2) expressiveness introduced originally by Nysveen et al. (2005), are included in the research model. Perceived enjoyment has been found to be relevant in other earlier studies as well (Shin 2007).

Also Rogers' (2003) attributes of innovations were taken into consideration when designing the research model although the attributes of innovations aren't directly comparable to beliefs in TRA. In addition, contrary to many services offered in "wired" internet, the user often faces some cost of e.g. data transfer when using different mobile services. Hence a characteristic introduced by Wang et al. (2006), perceived financial resource, is included to model the possible limiting effects of students' often limited financial resources.

Mallat et al. (2008) mention that "our key contribution is the finding that mobility and contextual elements play a very significant role in the adoption of mobile services and that these two factors should be more closely integrated into the existing adoption models to increase their predictive power". Same issues were found with the conducted pilot study. Thus the last four beliefs were added to the model: Independence of time and place; Social communication; and Information retrieval are all constructs based on the results of the pilot study, as described later in chapter 7.1.

Complete comparison between previous studies and characteristics affecting intention to use mobile services is on appendix A.

The research model also includes information sources as a foundation for beliefs which is in line with the assumption that human beings are usually quite rational and make systematic use of the information available to them (Ajzen & Fishbein 1980:5). Including the information sources in the model is also in line with the work of Rogers (2003).

Figure 13 presents the proposed research model:

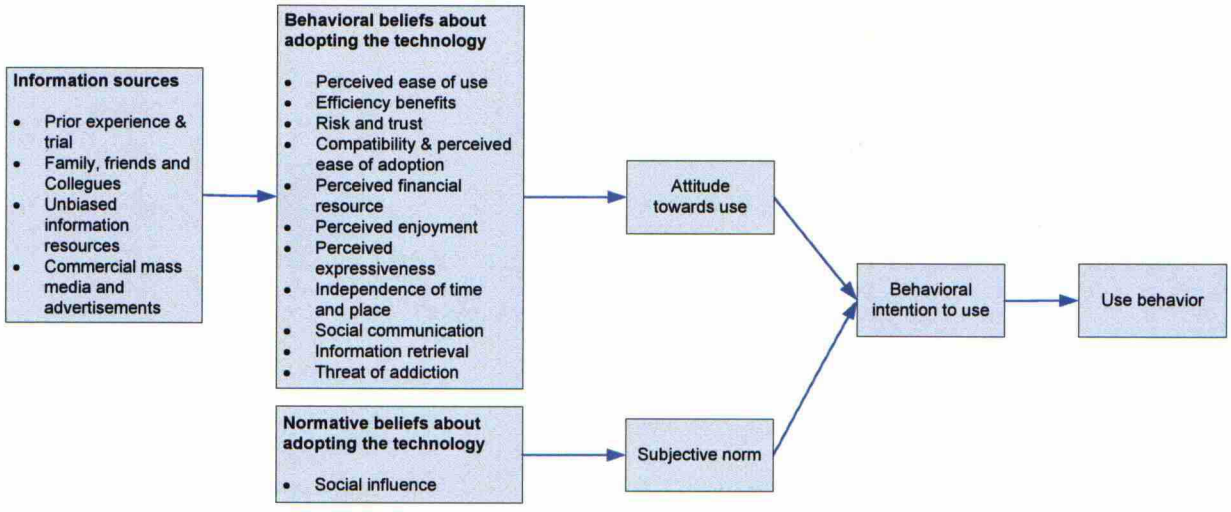

Figure 13: Research model

6.1.2 Categorization of services: personally and socially consumed mobile services

In this study mobile services are divided into two categories according to the way they are consumed. The division of services into personally and socially consumed mobile services is done according to their typical features and usage. Many services, such as reading news, looking maps or searching information from the internet, are typically computer-interactive and consumed personally and thus belong to the personally consumed mobile services category. Other services, such as email, instant messaging or social networking services are more communication/person -interactive and belong to the socially consumed mobile services category.

The categorization of different mobile services was made by type of interactivity of the service as described in Nysveen et al. (2005). They divided four mobile services (text

messaging, mobile contact services, mobile payment and mobile gaming) to categories according to their type of interactivity and use process characteristics. Both of the dimensions originated from the work of Hoffman and Novak (1996), who divided interactivity into two categories: person interactivity was defined as "interactivity between people that occurs through a medium" whereas machine interactivity was defined as interactivity with the medium in which a "user can participate in modifying the form and content of a mediated environment in real time".

The personally consumed mobile services category contains the following services

- News services
- Weather services
- e-banking
- Public transport timetables *(e.g. travel guide)*
- Entertainment & free time *(different entertainment centered services)*
- Maps and location services
- Finding information from products or services
- Where to go –services *(clubs, concerts)*
- Widsets *(platform for widgets in Java-enabled mobile phones)*
- Mobile television
- Location based services
- Blogs and RSS-feeds
- Whatever websites, based on need
- Any other services that fits this category

The socially consumed mobile services category contains the following services

- Email
- Status updates in Facebook or similar service
- Jaiku *(microblogging service, similar to e.g Twitter or Pownce. See www.jaiku.com)*
- Communicating with friends (one or more) in Facebook or similar service
- Watching (and commenting) friends' pictures in Facebook or similar service
- Instant messaging *(e.g. MSN messenger)*
- Uploading pictures from phone to the internet *(e.g. to Flickr or Facebook)*

- Uploading videos from phone to the internet *(e.g. to Flickr or Facebook)*
- Any other services that fits this category

The reasoning behind the division of the services derives from the basic principles of TRA. TRA assumes that the relative importance of attitude toward the behavior and subjective norm depends partly on the intention under investigation (Ajzen & Fishbein 1980:6) and thus it is interesting to study whether the intention to use the services differ between the two categories. Further Nysveen et al. (2005) point out that "classifications of services enable managers to use specific strategies to handle related services" which is also one goal of this study. Thirdly, the relative importance of subjective norm as a social influence could be expected to vary across behaviors and situations (Ajzen 1991) – here between the two categories.

The categorization of services offers also a possibility to compare the importance of different information sources in both of the service categories.

It should be noted that as I have divided the mobile services under study to two categories, the proposed research model in this study is not intended as general model for adoption of all kinds of mobile services. In contrary the research model only serves as base when searching differences between the categories.

6.2 Hypotheses

Before analyzing the empirical data, the research hypotheses are addressed here.

As discussed, many previous studies of mobile service adoption have either focused on only one service or they have tried to build an unified model for mobile service adoption. However based on the assumptions of TRA ((Ajzen & Fishbein 1980) I propose that

> H1: There is a distinction in effects of different behavioral beliefs between personally and socially consumed mobile services.

Also, the relative importance of subjective norm and attitude towards the behavior should be different considering different kind of situations or services (Ajzen & Fishbein 1980). Based on Innovation Diffusion Theory of Rogers (2003) I assume that interpersonal information channels are more important in socially consumed mobile services and thus the opinions of others have greater impact:

> H2: Subjective norm has greater effect on socially- than personally consumed mobile services.

Rogers (2003:171) states that individuals gain information about different services in different ways. Hence I assume that the learning mechanisms behind services in the two categories are different:

> H3: There is a distinction between the learning mechanisms (information sources) concerning personally and socially consumed mobile services.

According to a study of Hartikainen (2007), students described as innovators formed the group that had most positive attitude towards 3G phones and were most eager to adopt them in the near future. I assume that the individuals who have adopted 3G phones are also innovators when considering the adoption of mobile services.

> H4: Owners of a 3G phone are early innovators and thus have more positive attitude towards mobile services

Students are typically a group of people who don't have much extra money to play around. Thus the cost of mobile services is expected to form negative effects towards attitude and intention to use the services. Previous studies (e.g. Wang et al 2006, Mallat et al. 2008) have shown that the perceived cost of using mobile services may in fact affect intention to use them. Thus I present hypothesis 5:

> H5: Perceived cost of using mobile internet affects the intention to use it.

7 Empirical study

In this part, first the pilot study and its results are presented. Then I describe the design and methods of the conducted survey after which the measures used are discussed. The data gathered with the survey is then used in the next chapter to evaluate the theoretical model.

7.1 Pilot study

Before the actual survey, a pilot study was conducted among 50 business students of Helsinki School of Economics to examine whether the beliefs underlying students' attitudes are same in the two proposed categories (personal/social). In the pilot study 25 students answered to a question (following the formulation of Ajzen & Fishbein 1980:68) concerning the use benefits and negative effects of using personally consumed mobile services and the other 25 where asked to answer to similar question concerning socially consumed mobile services. The goal of the pilot study was to elicit the salient beliefs underlying students' attitude toward personally and socially consumed mobile services. A total of 43 answers were gotten (21 in personally consumed services, 22 in socially consumed services), overall response rate being 86 %.

In both the pilot and later in the actual study, the participants were given introduction text that focused on the service category in question. For example, in socially consumed mobile services survey, the text was as follows:

> "When answering to this survey, focus on socially consumed mobile services. Such are services that are used with a mobile device in different ways of interacting with others."

After this, examples of such services were given.

Table 1 and Table 2 summarize the most important results from the pilot study. The numbers represent the number of times the measure was mentioned in the lists of the respondents. It was also checked that the measures listed here were typically listed among the first ones to be sure that their intuitive relation to the question is high.

Personally consumed mobile services		Answers gotten: 21 out of 25	
Benefits		Disadvantages	
Speed / quickness	*13*	*Uncertainty, trust and risk*	*10*
Independence of time	*9*	*Technical problems and limitations*	*4*
Information retrieval	*8*	*Hard and slow to use*	*3*
Independence of place	*7*	*Expenses*	*3*

Table 1 : Summary of the pilot study, personally consumed mobile services

Socially consumed mobile services		Answers gotten: 22 out of 25	
Benefits		Disadvantages	
Social communication	*15*	*Threat of addiction*	*14*
Following friends doings	*10*	*Privacy issues and security*	*11*
Information retrieval and sharing	*8*		

Table 2 : Summary of the pilot study, socially consumed mobile services

After the pilot study, the research model was modified according to the findings of the pilot study to contain also the constraints that had high frequencies in the pilot study answers. Such constraints were 1) Independence of time and place, 2) Social communication, 3) Information retrieval and 4) Threat of addiction. From the other constructs mentioned in the pilot, *speed/quickness* is considered to be included in the efficiency benefit -constraint and *privacy issues and security* as well as *uncertainty, trust and risk* to be included in the trust&risk –constraint, both already present in the proposed research model.

7.2 Research design and method

The data for the empirical study was collected with an online-survey sent to 2000 university students in Finland. The respondents for the survey were selected randomly among Lyyra card owners. All respondents were owners of the Lyyra student card but not all of them used Lyyra's internet service. The goal was to examine students' attitudes towards mobile internet in general, existing mobile web services, mobile use of social web services (e.g. Facebook) and in particular the possible mobile use of Lyyra's prospective mobile services. In the survey the respondents were divided to two so that a personal link to the survey about personally consumed mobile services was sent to thousand students and other thousand students got links to questionnaire about socially consumed mobile services. Week after the first email, a remainder about the survey was sent to those who hadn't answered.

The survey was conducted individually on the internet without any time limitations. One strength of self-reports is that they can be obtained free of specific targets, contexts, or time (Ajzen & Fishbein 1980:38).

The survey was quite comprehensive as it included 110 well thought questions for the respondent covering all the proposed variables in the research model as well as some basic information about the respondents. The questions all belonged to a certain category measuring different constructs of the research model but this wasn't shown in the questionnaire.

7.3 Measures

The survey consisted of questions and statements to which the user had to react according to his intuition. The respondent was asked to answer to all questions based on his intuition or impression even if he didn't have any actual experience about mobile services in general or the service in question. Before the actual questions, the respondent was given a short introduction to the topic of the survey with some examples to make sure the respondent has the right services and concepts (i.e. personally or socially consumed services) in mind when answering to the questions.

The questionnaire was developed mostly based on material discussed and tested in previous studies of the area. However all questions from previous studies were translated into Finnish and modified to fit this study. Some additional questions were formulated for example based on the results of the pilot study. All questions were carefully designed to be as easy to understand as possible with minimum risk for misunderstandings. The thorough design of questions was important as wrong word choices or poor formulated questions could cause severe problems to the data. The full questionnaires (translated into English) are displayed in appendix C.

Ajzen & Fishbein (1980:39) proposed that behavioral criteria should include four elements: the action, the target at which the action is directed, the context in which it occurs, and the time at which it is performed (Ajzen & Fishbein 1980:39). In this study however, the context of the behavior was not defined. The action (use of mobile services of certain type) itself and the target of the action on question were introduced to the respondent in the introduction of

the questionnaire, and time frame of the behavior was set in each question when needed ("have you used" or "do you intent to use during next six months").

Seven point Osgood -scale (semantic differential) (Osgood, Suci & Tannenbaum, 1957) that ranged in almost all questions from *strongly disagree* to *strongly agree* was used. As said, the respondents self-administered the questionnaire and were asked to choose the response that best described their level of agreement with the statements.

The methods for the survey and scale for measurement were adopted from Ajzen and Fishbein (1980:66). In addition the strength of individual beliefs from each category was measured as suggested by Ajzen & Fishbein (1980:71) with a bipolar scale ranging from *extremely sure* to *extremely unsure*. This information about strength of the beliefs was however not utilized in the final analyses.

For information sources, the question was as follows: "considering mobile services, how important the following information sources are for you" and the scale altered from *very important* to *meaningless*. Intention to use mobile services was in turn measured with three different dimensions: intentions to try out, to use and to recommend mobile services were all measured.

8 Data analysis and results

TRA is originally targeted to individual decision making. Also in this study the survey was conducted with individual respondents and general level conclusions presented in this chapter are then drawn from aggregate level.

To the survey, a total of 122 answers were gotten in the personally consumed mobile services category compared to 140 in socially consumed mobile services. The combined response rate for the study finally was 13 %, which can be considered to be relatively good for an online survey.

In the case of a missing answer, the missing value was replaced in analyses phase with mean of other answers given to that question. However in questions measuring use or intention to use a particular service, an empty answer was interpreted as "strongly disagree".

Average age of the respondents was 29 years. Most of the answers were from students of the Helsinki University, which was expected as they also form the biggest user group of Lyyra.

8.1 3G ownership and mobile internet experience among respondents

Although 3G-phones are getting more popular in Finland, most of the respondents didn't own one at the time of the survey. Thus fast data connections are not yet available for everybody. Despite of this fact, about half of the respondents had used internet with their mobile phone. Further, it is interesting to notice that 11% of respondents couldn't say if the phone they own has 3G or not. I guess this illustrates the fact that to some technical specifications of the phone are not very important.

Owns a 3G phone	yes	no	don't know	answers (total)
Personally consumed services	28 %	62 %	10 %	122
Socially consumed services	29 %	59 %	13 %	140
Combined	28 %	60 %	11 %	262

Table 3: Rate of 3G phones among respondents

Seemingly lack of a 3G phone doesn't restrain the use of mobile services as the percentage of mobile internet users is much higher than the rate of 3G-phones among the respondents. Almost half of the students had experience with mobile internet. Respondents on the

personally consumed mobile services category were in general more experienced than respondents in the socially consumed mobile services category (52 % vs. 45 %). The results however represent the experience of the services in the particular research category and thus these figures can't be compared directly with each other. Further, prior experience & trialability in general was not even found to be very strong determinant of attitude (see 8.4: Effects of beliefs towards attitude) although it is an important source of information.

In general mobile internet use is more common among 3G owners as can be seen from Table 4. Most of the 3G phone users (84 %) had used internet with their mobile compared to only 34 % among non-3G users. One reason for this could be that users who have already taken into use 3G phones are to some extent early adopters and thus are also more willing to adopt new services the mobile internet offers. As discussed earlier, 3G-network enables better services and user experience whereas at least some of the non-3G internet use is probably WAP-usage which is much more limited.

Has used internet with mobile phone	All	3G users	non-3G users
Personally consumed services	52 %	79 %	43 %
Socially consumed services	45 %	88 %	26 %
Combined	48 %	84 %	34 %

Table 4: Earlier mobile internet usage

Also, telecom operators have marketed flat rate data plans and mobile internet mostly to 3G users which is understandable as a 3G phone with a modern mobile browser is needed to get the most out of different mobile services.

8.2 Personally consumed mobile services

To get some overall view about the usage of different services in both of the research categories, the students were asked to determine how often they use certain services of this category with their mobile device. Table 5 shows the distribution of answers in the scale from *daily* to *never*.

How often do you use the service?	*daily*						*never*
scale:	+3	+2	+1	0	-1	-2	-3
News services	5 %	4 %	8 %	2 %	4 %	11 %	65 %
Weather services	2 %	2 %	9 %	5 %	3 %	14 %	65 %
e-banking	1 %	3 %	7 %	4 %	2 %	6 %	77 %
Public transport timetables	2 %	8 %	13 %	6 %	3 %	12 %	56 %
Entertainment & free time	1 %	2 %	7 %	1 %	5 %	18 %	66 %
Maps and location services	1 %	6 %	15 %	4 %	4 %	12 %	58 %
Finding information from products or services	2 %	5 %	11 %	5 %	3 %	4 %	70 %
Where to go (clubs, concerts)	0 %	0 %	6 %	3 %	3 %	6 %	82 %
Widsets (platform for widgets)	0 %	1 %	2 %	2 %	0 %	5 %	91 %
Mobile television	0 %	0 %	0 %	2 %	2 %	2 %	94 %
Location based services	0 %	0 %	4 %	2 %	3 %	7 %	84 %
Blogs and RSS-feeds	1 %	2 %	2 %	1 %	2 %	4 %	88 %
Whatever websites, based on need	9 %	4 %	13 %	5 %	8 %	10 %	51 %
Some other personally consumed mobile service	1 %	0 %	5 %	17 %	2 %	6 %	69 %

Table 5: Use of personally consumed mobile services

The average answer in all services was between -1 and -3, so it can be said that mobile services belonging to this category aren't really popular among all students, at least not yet. The most popular answer in all services was "never" which indicates that many of the respondents perhaps don't have any experience in any or most of these services.

I interpret the values from +3 to +1 as indicators of (regular) usage. Answers from 0 to -2 could indicate that the respondent has tried the service in question, but don't use it regularly.

With this kind of analysis we see that at the moment most of the students don't use mobile services at all, or at least not regularly. One fourth (26 %) of the users use their mobile device to generally browse the web (*whatever websites, based on need)* which makes it the most popular function. Also public transport guide and timetable services were quite popular as 23 % use them (i.e. answered +3, +2 or +1). Maps and location services (21 %) was the third used service type, which probably is due to the growing amount of satellite position (GPS) capable phones and built in map features in phones.

Interestingly, the widsets platform for mobile widgets got low rates of usage as 91 % of the students stated that they never use the service. This is interesting in the light of the knowledge that the very service has been advertised in the Lyyra website and thus many of the respondents have presumably at least heard of the service.

The users were also asked to determine if they think they will use these services during the next six months.

I intent to use the service within the next 6 months	*strongly agree*						*strongly disagree*
scale:	+3	+2	+1	0	-1	-2	-3
News services	14 %	6 %	7 %	4 %	5 %	11 %	54 %
Weather services	10 %	11 %	7 %	3 %	5 %	8 %	56 %
e-banking	10 %	2 %	8 %	7 %	4 %	8 %	61 %
Public transport timetables	20 %	6 %	11 %	2 %	6 %	12 %	43 %
Entertainment & free time	4 %	9 %	9 %	3 %	4 %	6 %	65 %
Maps and location services	11 %	10 %	11 %	5 %	8 %	6 %	50 %
Finding information from products or services	9 %	10 %	7 %	3 %	2 %	8 %	60 %
Where to go (clubs, concerts)	2 %	5 %	10 %	2 %	2 %	12 %	66 %
Widsets (platform for widgets)	2 %	1 %	0 %	7 %	2 %	7 %	80 %
Mobile television	1 %	0 %	3 %	3 %	2 %	9 %	81 %
Location based services	2 %	4 %	6 %	6 %	3 %	11 %	69 %
Blogs and RSS-feeds	3 %	2 %	6 %	3 %	5 %	5 %	75 %
Whatever websites, based on need	16 %	10 %	10 %	7 %	2 %	8 %	48 %
Some other personally consumed mobile service	1 %	5 %	10 %	15 %	2 %	7 %	61 %

Table 6: Intention to use personally consumed mobile services

Intention to use was biggest towards public transport guide and timetable services as 37 % of the respondents thought they would use those during the next six months (answers from +3 to +1). Popular were also general internet surfing (35 %) and maps and location services with 31 %. Notably these same services got high rates in the usage question as well. It is also interesting that most of the students felt really sure about their intentions, as "strongly agree" was chosen quite often: for example in the case of public transport, 20% of the students agreed strongly with the statement.

In all services the intention to use the service exceeded the present use. The following table includes changes (as percentage units) from the present use to intentions to use. It can be said that during the next six months, the use of different personally used mobile services among student will grow by 1 to 15 percentage units compared to the present situation.

Change/category (percentage units)	+3 to +1	0	-1 to -3
News services	9 %	2 %	-11 %
Weather services	15 %	-2 %	-13 %
e-banking	9 %	3 %	-12 %
Public transport timetables	14 %	-4 %	-10 %
Entertainment & free time	12 %	2 %	-15 %
Maps and location services	10 %	1 %	-11 %
Finding information from products or services	8 %	-2 %	-7 %
Where to go (clubs, concerts)	11 %	-1 %	-10 %
Widsets (platform for widgets)	1 %	6 %	-7 %
Mobile television	4 %	2 %	-6 %
Location based services	7 %	4 %	-11 %
Blogs and RSS-feeds	7 %	2 %	-9 %
Whatever websites, based on need	9 %	2 %	-11 %
Some other personally consumed mobile service	10 %	-2 %	-7 %

Table 7: Intention vs. use of personally consumed mobile services

When compared to present usage, intention to use is highest with weather and public transportation timetables services, which already had a solid base of current users. Although mobile television has gotten quite much presence in the media, the students aren't that interested in the service as practically no one used it at the moment and also intention to use the service remained low.

8.3 Socially consumed mobile services

In the socially consumed mobile services category, the students determined their use of different mobile services as illustrated in Table 8.

How often do you use the service?	*daily*						*never*
scale:	+3	+2	+1	0	-1	-2	-3
Email	33 %	8 %	4 %	2 %	3 %	9 %	41 %
Status updates in Facebook or similar service	1 %	4 %	12 %	2 %	5 %	9 %	67 %
Jaiku or other "microblogging"	1 %	0 %	1 %	2 %	4 %	1 %	91 %
Communicating with friends (one or more) in Facebook or similar service	1 %	6 %	15 %	4 %	2 %	8 %	64 %
Watching (and commenting) Friends' pictures in Facebook or similar service	0 %	6 %	16 %	4 %	5 %	6 %	64 %
Instant messaging (e.g. messenger)	9 %	9 %	14 %	5 %	4 %	4 %	56 %
Uploading pictures from phone to the internet (e.g. to Flickr or Facebook)	1 %	0 %	9 %	6 %	4 %	4 %	78 %
Uploading videos from phone to the internet (e.g. to Flickr or Facebook)	1 %	0 %	1 %	3 %	1 %	6 %	89 %
Other services that fits this category	1 %	0 %	5 %	17 %	4 %	6 %	68 %

Table 8: Use of socially consumed mobile services

Not surprisingly e-mail was by far the most popular service in this category as the others scored much lower figures, Instant messaging being the second popular service in this category. Least popular was "Jaiku or other microblogging" as 91 % of the students indicated they have never used such services. This was also expected since microblogging a phenomenon not many even know exists.

The intention to use socially consumed mobile services within the next six months varied between different services as can be seen from Table 9.

I intent to use the service within next 6 months	*strongly agree*						*strongly disagree*
scale:	+3	+2	+1	0	-1	-2	-3
Email	47 %	4 %	5 %	4 %	6 %	8 %	27 %
Status updates in Facebook or similar service	12 %	5 %	9 %	5 %	6 %	4 %	59 %
Jaiku or other "microblogging"	0 %	1 %	1 %	8 %	4 %	7 %	78 %
Communicating with friends (one or more) in Facebook or similar service	13 %	4 %	11 %	3 %	4 %	9 %	57 %
Watching (and commenting) Friends' pictures in Facebook or similar service	9 %	10 %	11 %	6 %	3 %	5 %	56 %
Instant messaging (e.g. messenger)	21 %	8 %	10 %	9 %	3 %	8 %	41 %
Uploading pictures from phone to the internet (e.g. to Flickr or Facebook)	2 %	3 %	6 %	9 %	11 %	8 %	61 %
Uploading videos from phone to the internet (e.g. to Flickr or Facebook)	0 %	2 %	4 %	8 %	5 %	8 %	73 %
Other services that fits this category	0 %	4 %	4 %	17 %	7 %	11 %	57 %

Table 9: Intention to use socially consumed mobile services

Also in this category the intention to use the service exceeded the present use in all services. However the changes were remarkably lower compared to the other category (except in email), possibly because this category also included services from which the students haven't perhaps even heard of. Also the usage of socially consumed mobile services in general was lower to start with (again, except in email) than the use of many personally consumed services.

The challenge with socially consumed mobile services is to get the critical mass to the service as the networks are more useful to the user the more users they have (Rogers 2003:363). It is possible that these services don't have yet enough users to attract the average user and thus many of the respondents didn't see them as services they would use in the near future.

The following table includes changes (as percentage units) from the present use to intentions to use. During the next six months, the use of different socially used mobile services among student will according to the survey grow by 1 to 11 percentage units.

Change/category (percentage units)	+3 to +1	0	-1 to -3
Email	11 %	1 %	-13 %
Status updates in Facebook or similar service	9 %	3 %	-11 %
Jaiku or other "microblogging"	1 %	6 %	-7 %
Communicating with friends (one or more) in Facebook or similar service	6 %	-1 %	-5 %
Watching (and commenting) Friends' pictures in Facebook or similar service	9 %	2 %	-11 %
Instant messaging (e.g. messenger)	9 %	4 %	-13 %
Uploading pictures from phone to the internet (e.g. to Flickr or Facebook)	2 %	3 %	-5 %
Uploading videos from phone to the internet (e.g. to Flickr or Facebook)	4 %	5 %	-9 %
Other services that fits this category	2 %	0 %	-2 %

Table 10: Intention vs. use of socially consumed mobile services

When compared to present usage, intention to use is highest with email, which already had a solid base of current users. Also instant messaging and the use of Facebook in forms of status updates and commenting of pictures were something the students might adopt within the next six months.

8.4 Effects of beliefs towards attitude

The main goal of this study is to find out whether beliefs underlying attitudes toward mobile services differ between personally and socially consumed mobile services. To illustrate this, the data from the survey is analyzed with two regression models, one for each service category. In addition a regression model containing the full combined data of the two surveys is presented.

The proposed research model included altogether 12 beliefs which all were either presented in earlier literature or taken into the model based on the conducted pilot study. The selection process and sources of these beliefs was discussed earlier.

Beliefs proposed in the research model:

- Perceived ease of use
- Efficiency benefits
- Risk & trust
- Compatibility & perceived ease of adoption
- Perceived financial resource
- Perceived enjoyment
- Perceived expressiveness
- Independence of time and place
- Social communication
- Information retrieval
- Threat of addiction

Next I present regression models containing all the beliefs for both of the categories and also for the combined data. Based on these models I analyze which of the beliefs really have statistically significant influence on attitude towards the services of the category at hand. After that, final models where all variables included in the full regression model that were not significant at the .05 level (or better) are dropped, are built and tested. All these models and the results are presented next.

8.4.1 Personally consumed mobile services

Considering personally consumed mobile services, I built at first a regression model containing all the beliefs as dependent variables and attitude as the independent variable. The full model had an adjusted R^2 of 0.79 with significance level under 0.0001.

The next table summarizes the results of this model.

Independent variable: Attitude towards use		Parameter Estimates				
Variable	**DF**	**Parameter Estimate**	**Standardized Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	1	10.86921	0	1.90708	5.70	<.0001
Perceived ease of use	1	0.18748	0.07079	0.16630	1.13	0.2621
Efficiency benefits	1	0.43804	0.54685	0.05969	7.34	<.0001
Independence of time and place	1	0.34889	0.14624	0.14849	2.35	0.0206
Compatibility & perceived ease of adoption	1	-0.08753	-0.06275	0.10971	-0.80	0.4267
Perceived financial resource	1	-0.09016	-0.04369	0.08955	-1.01	0.3163
Prior experience & trialability	1	0.09417	0.05508	0.10105	0.93	0.3534
Risk & trust	1	0.07204	0.02960	0.10602	0.68	0.4983
Perceived expressiveness	1	0.27561	0.09568	0.16544	1.67	0.0986
Perceived enjoyment	1	0.09768	0.04262	0.14286	0.68	0.4956
Social communication	1	0.08287	0.03466	0.14813	0.56	0.5770
Information retrieval	1	0.65366	0.13507	0.28728	2.28	0.0248
Threat of addiction	1	-0.27763	-0.10469	0.11713	-2.37	0.0195

Table 11: Personally consumed mobile services - regression model containing all proposed beliefs

Based on this model, I reviewed the significance of all of the variables. All dependent variables with H_0 probability over 0.05 were rejected as not significant enough. The probability-values of the rejected variables are highlighted in the table. Based on this analysis, only four of the beliefs can be seen as reliable determinants of attitude. These four are Efficiency benefits, Independence of time and place, Information retrieval and Threat of addiction.

The results of the revised model are presented in Table 12:

Independent variable: Attitude towards use		Parameter Estimates				
Variable	**DF**	**Parameter Estimate**	**Standardized Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	1	14.11950	0	1.16969	12.07	<.0001
Efficiency benefits	1	0.51732	0.64583	0.05174	10.00	<.0001
Independence of time and place	1	0.40723	0.17069	0.14400	2.83	0.0055
Information retrieval	1	0.72288	0.14937	0.27116	2.67	0.0088
Threat of addiction	1	-0.25303	-0.09541	0.11462	-2.21	0.0292

Table 12: Revised regression model - personally consumed mobile services

In the revised model all included dependent variables are statistically significant determinants of attitude. Also the model is statistically significant (Pr>F) at 0.0001 level. The adjusted R square for the model is high: 0.79.

Threat of addiction has a negative effect on attitude, as expected, whereas the others have positive correlation with attitude. Efficiency benefits have the strongest influence towards attitude. Also Independence of time and place and Information retrieval display good influence towards attitude which is in line with the results of the pilot study. Threat of addiction was quite surprising belief to be included in the final model as it was in the pilot study found to be important considering socially-, not personally consumed mobile services.

Based on these finding we can draw the final model for adoption of personally consumed mobile services:

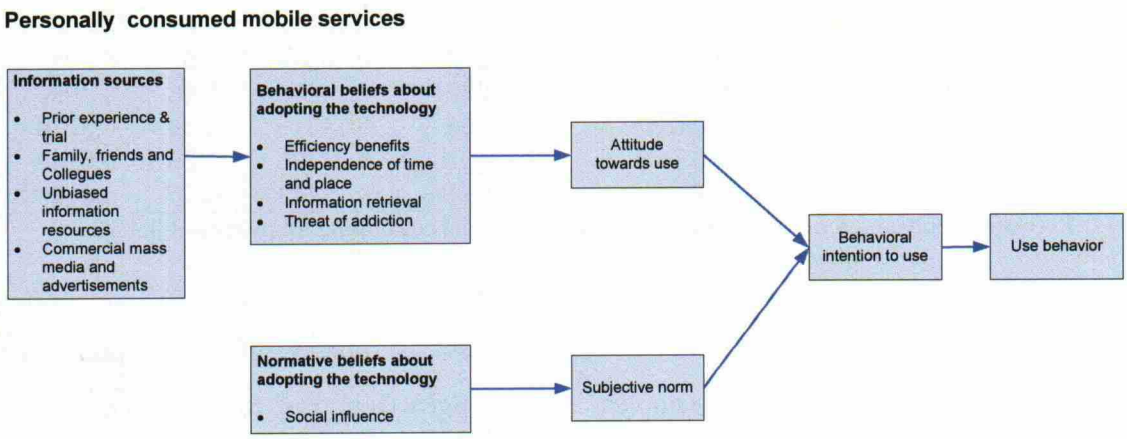

Figure 14: Adoption model for personally consumed mobile services

8.4.2 Socially consumed mobile services

As in the case of personally consumed mobile services, also in this category a regression model was built containing all the beliefs as dependent variables and attitude as the independent variable. The full model showed even higher adjusted R^2 (0.81) than in the previous category, with significance level under 0.0001.

The next table summarizes the results of the model containing all beliefs present in the proposed research model:

Independent variable: Intention to use		Parameter Estimates				
Variable	**DF**	**Parameter Estimate**	**Standardized Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	1	7.13582	0	1.53185	4.66	<.0001
Perceived ease of use	1	0.01807	0.00776	0.12971	0.14	0.8894
Efficiency benefits	1	0.46266	0.65319	0.05075	9.12	<.0001
Independence of time and place	1	-0.00076432	-0.00040205	0.10814	-0.01	0.9944
Compatibility & perceived ease of adoption	1	0.25729	0.19858	0.08747	2.94	0.0039
Perceived financial resource	1	-0.00551	-0.00294	0.07493	-0.07	0.9415
Prior experience & trialability	1	-0.14562	-0.09658	0.08987	-1.62	0.1076
Risk & trust	1	0.03346	0.01817	0.07181	0.47	0.6421
Perceived expressiveness	1	0.45146	0.18097	0.12612	3.58	0.0005
Perceived enjoyment	1	0.11413	0.05387	0.11395	1.00	0.3185
Social communication	1	0.09950	0.05432	0.12176	0.82	0.4153
Information retrieval	1	-0.17390	-0.04508	0.20591	-0.84	0.4000
Threat of addiction	1	-0.12218	-0.05340	0.09421	-1.30	0.1970

Table 13: Socially consumed mobile services - regression model containing all proposed beliefs

The t-probabilities of rejected variables are again highlighted in the table. In this category, only three of the beliefs can be seen as statistically reliable determinants of attitude. These three are Efficiency benefits, Compatibility & perceived ease of adoption and Perceived expressiveness.

New, revised model containing the accepted beliefs is presented below:

Independent variable: Intention to use		Parameter Estimates				
Variable	**DF**	**Parameter Estimate**	**Standardized Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	1	6.70195	0	0.96143	6.97	<.0001
Efficiency benefits	1	0.48197	0.68045	0.03625	13.30	<.0001
Compatibility & perceived ease of use	1	0.19934	0.15385	0.06501	3.07	0.0026
Perceived expressiveness	1	0.45936	0.18414	0.10990	4.18	<.0001

Table 14: Revised regression model - socially consumed mobile services

The variation of dependent variables in the model explains most of the variation in the independent variable as adjusted R^2 for the model is very high: 0.81. In the revised model all included dependent variables are statistically significant determinants of attitude and Efficiency benefits have again the strongest influence towards attitude. Perceived expressiveness was expected to be in the final model considering this category as it was present also in the pilot study.

Based on these findings we can draw the final model for adoption of socially consumed mobile services:

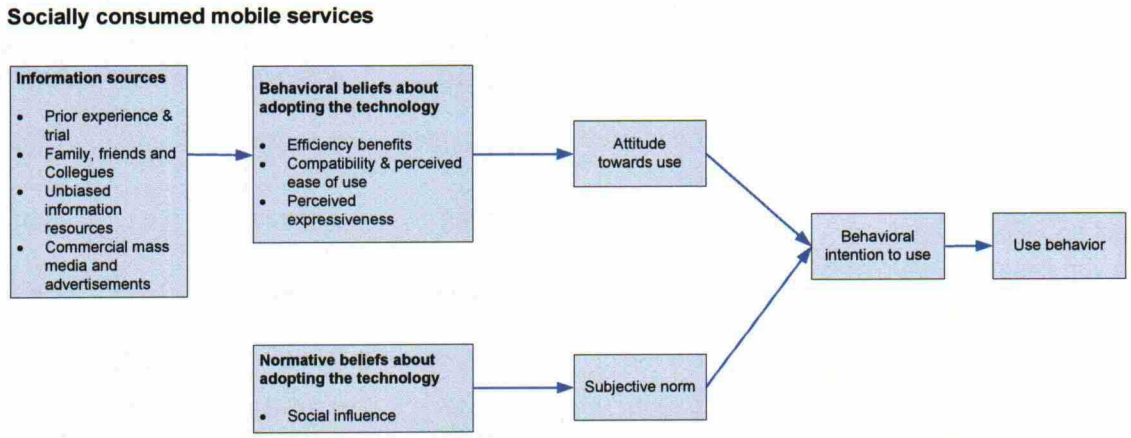

Figure 15: Adoption model for socially consumed mobile services

8.4.3 Combined model

To see how a unified model drawn from this data would differ from the category-specific models, a regression model containing the combined data of both categories was formed. Results of the regression model with all the suggested beliefs are presented in the following table:

Independent variable: Intention to use		Parameter Estimates				
Variable	**DF**	**Parameter Estimate**	**Standardized estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	1	9.05607	0	1.37434	6.59	<.0001
Perceived ease of use	1	0.23034	0.09099	0.11740	1.96	0.0509
Efficiency benefits	1	0.39853	0.51856	0.04349	9.16	<.0001
Independence of time and place	1	0.14909	0.06880	0.10142	1.47	0.1428
Compatibility & perceived ease of adoption	1	0.14937	0.10841	0.07754	1.93	0.0552
Perceived financial resource	1	-0.04852	-0.02408	0.06552	-0.74	0.4597
Prior experience & trialability	1	-0.12103	-0.07406	0.07380	-1.64	0.1023
Risk & trust	1	-0.01889	-0.00887	0.06935	-0.27	0.7855
Perceived expressiveness	1	0.40636	0.14985	0.11174	3.64	0.0003
Perceived enjoyment	1	0.22992	0.10242	0.10081	2.28	0.0234
Social communication	1	0.13325	0.06293	0.10504	1.27	0.2058
Information retrieval	1	-0.03903	-0.00894	0.18940	-0.21	0.8369
Threat of addiction	1	-0.18646	-0.07425	0.08394	-2.22	0.0272

Table 15: Combined research data - regression model containing all proposed beliefs

Adjusted R^2 of the model reaches 0.74 with significance level under 0.0001.

This model shows support for five beliefs to be taken into the revised model, which is presented next:

Independent variable: Intention to use		Parameter Estimates				
Variable	**DF**	**Parameter Estimate**	**Standardized estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	1	8.27587	0	1.07144	7.72	<.0001
Perceived ease of use	1	0.30314	0.11975	0.10253	2.96	0.0034
Efficiency benefits	1	0.45318	0.58967	0.03452	13.13	<.0001
Perceived expressiveness	1	0.46835	0.17270	0.10275	4.56	<.0001
Perceived enjoyment	1	0.29042	0.12936	0.09430	3.08	0.0023
Threat of addiction	1	-0.18656	-0.07429	0.08153	-2.29	0.0229

Table 16: Revised regression model - combined research data

This model from the combined data contains more variables than the individual models presented above. The adjusted R^2 was 0.74 which is lower than in the individual models but still a remarkable high figure.

8.4.4 *Cross-comparison between the models for personally- and socially consumed mobile services*

The above discussion about beliefs effects on attitudes in different categories postulates that the main statement (and thus H1) of this study holds true: personally and socially consumed mobile services have different determinants of attitudes and thus a unified model can't be accurate when predicting users' attitudes (and intentions).

To make sure that the data and models of the two categories really are significantly different, the two regression models presented above are cross-tested with the data of the other category.

When trying to form a regression model with the data of socially consumed services and the dependent variables (beliefs) determined in the personally consumer mobile services –model we get the following output:

Independent variable: Intention to use	Parameter Estimates					
Variable	**DF**	**Parameter Estimate**	**Standardized estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	1	11.53992	0	0.97524	11.83	<.0001
Efficiency benefits	1	0.56527	0.79806	0.04636	12.19	<.0001
Independence of time and place	1	0.12719	0.06690	0.11163	1.14	0.2566
Information retrieval	1	0.16625	0.04310	0.20402	0.81	0.4166
Threat of addiction	1	-0.14414	-0.06300	0.09356	-1.54	0.1258

Table 17: Cross comparison: personally consumed mobile services model with data from socially consumed services

It is easily seen that only efficiency benefits variable, which was present also in the "own" model of socially consumed services, fits this data. Hence the model doesn't apply to the data collected considering this category.

The same examination is done with the data of personally consumed mobile services and the dependent variables (beliefs) determined in the socially consumer mobile services:

Independent variable: Intention to use		Parameter Estimates				
Variable	**DF**	**Parameter Estimate**	**Standardized estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	1	10.22562	0	1.40091	7.30	<.0001
Efficiency benefits	1	0.60634	0.75696	0.04731	12.82	<.0001
Compatibility & perceived ease o	1	0.14773	0.10591	0.08409	1.76	0.0815
Perceived expressiveness	1	0.25888	0.08987	0.15264	1.70	0.0925

Table 18: Cross comparison: socially consumed mobile services model with data from personally consumed services

Also here efficiency benefits is the only variable that fits well in the model. The two other determinants of attitude are rejected.

These tests then also support hypothesis 1.

8.4.5 Discussion about beliefs affecting attitude

The beliefs included in the three different models are summarized in the following table:

Independent variable: Intention to use	Included in model?		
Variable	**Personally consumed**	**Socially consumed**	**Combined model**
Perceived ease of use			yes
Efficiency benefits	Yes	yes	yes
Independence of time and place	Yes		
Compatibility & perceived ease of adoption		yes	
Perceived financial resource			
Prior experience & trialability			
Risk & trust			
Perceived expressiveness		yes	yes
Perceived enjoyment			yes
Social communication			
Information retrieval	Yes		
Threat of addiction	Yes		yes

Table 19: comparison of beliefs in the three presented models

Efficiency benefits ("perceived usefulness" in TAM and many other studies) was proved to be a good implicate of intention and it was the only one which was present in all of the final models. Interestingly, in contrary to many earlier studies, perceived ease of use, present in TAM and many other studies, was not a good implicate of intention in either of the individual research categories although it was finally included in the combined model.

It is also interesting that threat of addiction was found to be a significant determinant of attitude in the personally- but not in socially consumed mobile services. The combined model however included also this belief. In addition, according to Nysveen et al. (2005) perceived expressiveness has no effect on attitude toward using mobile services. This is opposite to my findings considering socially consumed mobile services and the combined model.

Based on this table I also have to reject hypotheses six, as Perceived cost is not included in any of the models. It then seems that students either don't see the cost of mobile services to bee high or then they perceive the services so useful that they are ready to invest in mobile them.

The comparison between the individual models and the model based on combined data indicates that when adoption is modeled in general level (e.g. TAM, UTAUT), the model can in fact include constructs that don't actually have predictive power towards more specific situations. We see that many of the beliefs presented in earlier studies weren't included in either one of the models, which again indicates that the models presented in earlier studies can't be generalized to cover all services and situations.

8.5 Intention and effects of attitude and subjective norm

The proposed research model articulates that intention to use mobile services is affected by two constraints: attitude towards the service and subjective norm. To empirically prove this, a regression model with these factors is presented for both of the research categories as well as for combined data.

8.5.1 Personally consumed mobile services

As with beliefs and attitudes, also here a regression model was built with Attitude towards use and Social influence as dependent variables and Intention to use as the independent variable.

In the regression model, adjusted R^2 is 0.45 and the model was found to be statistically significant (Pr>F, <.0001).

Independent variable: Intention to use	Parameter Estimates				
Variable	**DF**	**Parameter Estimate**	**Standardized Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	1	-2.46118	0	2.05248	-1.20	0.2329
Attitude towards use	1	0.47841	0.51520	0.08712	5.49	<.0001
Social influence	1	0.26155	0.20957	0.11709	2.23	0.0274

Table 20: Effects of attitude and social norm towards intention to use - personally consumed mobile services

In this category it seems that Attitude has a greater effect on intention than the social influence does.

8.5.2 Socially consumed mobile services

In this category the model explained the variance in attitudes a little bit better as adjusted R^2 of the model is 0,52 and the model was statistically significant (Pr>F, <.0001).

Independent variable: Intention to use	Parameter Estimates				
Variable	**DF**	**Parameter Estimate**	**Standardized Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	1	-2.32003	0	1.64221	-1.41	0.1600
Attitude towards use	1	0.57878	0.56796	0.08796	6.58	<.0001
Social influence	1	0.22448	0.20120	0.09631	2.33	0.0212

Table 21: Effects of attitude and social norm towards intention to use - socially consumed mobile services

Also in this category attitude has grater effect on intention than the social influence does. In fact the role of social influence is almost the same as in the previous category but the effect of attitude is greater, which is in contrast with hypotheses H2. Hence H2 is rejected.

8.5.3 Combined model

On the combined model of effects of attitude and social influence towards use, the adjusted R^2 is 0.47 and the model was statistically significant (Pr>F, <.0001)

Independent variable: Intention to use		Parameter Estimates				
Variable	DF	Parameter Estimate	Standardized Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-1.80583	0	1.30136	-1.39	0.1664
Attitude towards use	1	0.46515	0.48996	0.06001	7.75	<.0001
Social influence	1	0.29341	0.24959	0.07431	3.95	0.0001

Table 22: Effects of attitude and social norm towards intention to use - combined model

In this model, the social influence seems to have greater influence than in the individual models. On the other hand, attitude's influence is somewhat lower.

8.6 Discussion about effects of attitude and subjective norm to intention

The authors of TRA, which forms the foundations for my research model, assume that the relative importance of attitude and social norm depends partly on the intention under investigation (Ajzen & Fishbein 1980:6). Thus it was expected that some differences between the two models would emerge. Based on earlier literature (e.g. Rogers 2003), it was expected that the effect of social norm would be bigger in socially consumed services. However the difference between the two models was quite small and opposite to what was expected. This surprising result leads to rejection of hypotheses H2.

In both of the research categories, social norm was found to be less important component affecting the intention than attitude. This indicated that users form their decisions relying more on personal reasoning and evaluation about the outcomes of the possible usage of the service in question than on opinions on others or feelings of social pressure.

8.7 Information sources

Many previous studies have shown that beliefs can be used to explain attitude and usage of information systems or services. However, not much has been said about how these beliefs

are formed. Information sources measured in this study help to build understanding towards this as beliefs, attitudes and the decision process are built based on the information the individual has on hand (Ajzen & Fishbein 1980:5, Rogers 2003:169).

The respondents were asked how important different information sources are to them considering mobile services. The results are presented in the following table:

Importance of information sources	personally consumed	socially consumed	difference	combined
Prior experience, getting to know the services	2,08	2,36	0,28	2,23
Friends, family and colleagues	2,63	2,72	0,09	2,68
Unbiased sources (e.g. consumer agency)	3,29	3,32	0,03	3,30
Media, mass media, advertisements	3,89	3,99	0,01	3,94

Table 23: Importance of different information sources

In a scale from 1=very important to 7=meaningless, own experiences were valued highest (average 2.23). Also information from friends, family and colleagues was considered important (average 2.68). The media and advertisements were seen as less important sources of information.

The differences on importance of information resources between the two research categories are small. All of the information sources got lower points from the respondents in the socially consumed services category. Importance of "Prior experience and getting to know the services" showed the biggest difference between personally and socially consumed services.

As the differences between the results of the two categories remained low, hypotheses H3 is rejected.

Pagani (2004) points out that consumers need to be educated about the possibilities of mobile services and the benefits they can offer to their daily lives. However as my results demonstrate, traditional mass marketing may not be the most efficient way to educate the potential users. The results indicate that to get the message about a new mobile service through to the end users, a company should try to get the users to test their solution. This could be done for example with a demo-solution in the company web site.

More innovative ways of marketing can also be utilized. For example, the Wi-Bro (mobile internet standard in Korea) users are positively influenced by word of mouth from other

users (Shin 2007) which indicates that the critical users that must be reached are the opinion leaders who have great influence on others. The same conclusion is also presented in the innovation diffusion studies by Rogers (2003:380). Also, Nysveen et al. (2005) explain that studies of text messaging use have shown that the most important way to express one's service use is to discuss and share the service with others. To stimulate word of mouth and peer recommendations, a service provider could try to find the opinion leaders and change agents and offer them the service to be used for free.

Media and advertisements were considered important to some extent but they sure aren't the best channel to reach students. Empirical evidence of this is the widsets service, which have had advertisements in Lyyra website. However widsets was rarely used by the students although it had tried to reach student through the banner on Lyyra website.

8.8 Case Lyyra

According to the results, 64 % of the respondents are registered users of Lyyra web service (www.lyyra.fi). Attitude toward Lyyra as a service provider was carefully positive; with a scale from 1=extremely positive to 7=extremely negative the average was 3.3.

I'm willing to use the service with my mobile now or in the future	*strongly agree*						*strongly disagree*
scale:	+3	+2	+1	0	-1	-2	-3
Check the balance on my Lyyra card	16 %	16 %	26 %	13 %	6 %	5 %	17 %
Transfer money from my e-bank to Lyyra account	15 %	19 %	16 %	11 %	9 %	8 %	20 %
Upload pictures to Lyyra web service	1 %	4 %	6 %	13 %	9 %	17 %	46 %
Upload videos to Lyyra web service	1 %	1 %	5 %	14 %	7 %	14 %	56 %
See my friends photos in the service	3 %	4 %	9 %	18 %	9 %	12 %	44 %
Buy or download music to my mobile	4 %	4 %	12 %	14 %	10 %	14 %	41 %
Get news and information from my student organization	6 %	10 %	21 %	13 %	8 %	10 %	30 %
See today's menus in student cafeterias	21 %	20 %	23 %	10 %	6 %	5 %	13 %
See event calendar	7 %	15 %	21 %	15 %	6 %	8 %	26 %
See what benefits I can get with my student card	17 %	21 %	22 %	11 %	5 %	5 %	16 %
See public transport time tables	20 %	21 %	14 %	11 %	6 %	6 %	20 %
Find the nearest student cafeteria from map	14 %	16 %	17 %	13 %	7 %	9 %	23 %

Table 24: Willingness to use Lyyra's mobile services in the future

Table 24: Willingness to use Lyyra's mobile services in the future summarizes the combined answers considering possible use of some mobile services Lyyra could provide in the future.

Most popular service would be menus of student cafeterias with 64 % support. More than half of the students would also be willing to see what benefits they can get with their student card, transfer money to their Lyyra card and see public transport time tables. Also finding the nearest student cafeteria got quite a strong support with 47 % positive answers. Multimedia services such as uploading pictures or downloading music on the other hand are not seen important.

It is noticeable considering transferring money to the Lyyra card that not all Lyyra owners (and thus respondents) can yet use their Lyyra card to payments on their campus area. Hence the willingness to use that service can actually be even higher among those who really use the card to conduct payments in their campus.

In all categories, over 10% of the respondents chose the middle option "0" as their answer, which indicates that many students aren't actually sure if they will adopt mobile services in the near future. This could be because they don't know when they will have better phone or for example flat rate internet access in their phone.

It is also interesting to investigate the data divided in to categories according to whether the person owns a 3G phone or not. Willingness to use Lyyra's services according this categorization is presented in the Table 25:

The table shows that in all services, the owners of 3G phones are more eager to take into use new mobile services. The percentages presented are almost the same in public transport time tables, in other categories the difference is between 6 and 24 percentage units. This indicates that in general, a negative answer towards intention to use can maybe in some cases indicate that the respondent feels that she doesn't have the facilities needed to use these services. This finding is in accordance with Rogers' (2003: 249) technology clusters. He explains that considering diffusion of some bundles of innovations, the adoption of one innovation can trigger the adoption of others. In the case of mobile services, it is very probably that the adoption of a 3G phone (which enables fast data transfers and has a proper browser etc.) can be a predecessor of intentions to adopt mobile services as such.

Willingness to use services with mobile within the next 6 months	3G owners			non-3G owners		
category:	+3 to +1	0	-1 to -3	+3 to +1	0	-1 to -3
Check the balance on my Lyyra card	64 %	14 %	22 %	56 %	14 %	31 %
Transfer money from my e-bank to Lyyra account	55 %	11 %	34 %	49 %	12 %	39 %
Upload pictures to Lyyra web service	26 %	11 %	63 %	6 %	14 %	80 %
Upload videos to Lyyra web service	15 %	14 %	71 %	4 %	14 %	82 %
See my friends photos in the service	22 %	14 %	64 %	14 %	19 %	67 %
Buy or download music to my mobile	31 %	13 %	57 %	16 %	15 %	69 %
Get news and information from my student organization	44 %	13 %	43 %	36 %	13 %	51 %
See today's menus in student cafeterias	80 %	9 %	11 %	59 %	11 %	30 %
See event calendar	53 %	16 %	30 %	40 %	15 %	45 %
See what benefits I can get with my student card	78 %	8 %	14 %	55 %	13 %	32 %
See public transport time tables	57 %	9 %	34 %	56 %	13 %	32 %
Find the nearest student cafeteria from map	59 %	5 %	36 %	43 %	16 %	41 %

Table 25: Willingness to use Lyyra's mobile services according to 3G phone ownership

We must however be careful before making conclusion about this. On the ground of the data, it could be said that an owner of a 3G-phone is more likely to adopt new mobile services. This may however be only partly true, as many of the present 3G owners are early adopters and innovators, who typically have more positive attitude towards the technology and new services in general (Hartikainen 2006). Further if the present 3G owners represent the innovators and early adopters then, according to Diffusion of Innovations theory, we haven't seen yet the full diffusion of mobile services and the mobile service adoption by the majority is still to be seen.

9 Discussion

TRA, TAM and also my research assume that when someone forms an intention to act, they will be free to act without limitation. In the real world there are many constraints, such as limited ability, time constraints, environmental or organizational limits, or unconscious habits which limit the individual's freedom to act (Kripanont 2007). This has to be noticed also when interpreting the results of this study as some students may intent to use mobile services in the (near) future but are not able to do so because they don't for example have a device that supports these services or they lack the needed financial resources to use mobile services.

As Rogers (2003:359) points out, innovation diffusion is highly social in nature: an individual's threshold for adoption is reached when a certain number of the individual's peers have adopted the innovation. In the light of the results of my study it seems that only the innovators, who have very low threshold for adoption, have adopted at least some mobile services as the threshold for critical mass has not been reached. This is especially important considering mobile social media services, as social networks are more useful the more users they have and the benefits from each additional adoption increase the utility of the service not only for all future adopters, but also for each previous adopter (Rogers 2003:363). Thus they require a large user base to offer true benefits to the user. This study indicates that the tipping point (Rogers 2003:352) is not reached yet for these services. However it should be noted that services like Facebook and MySpace already have a solid user base on the internet which gives them competitive advantage compared to totally new services trying to create mobile social networks.

One could assume that the users are more willing to use "useful" utility services such as news services with a higher price, but to get the users also to use entertainment services, such as music or social media services, the services should be very inexpensive to use. Thus financial resources should limit more the use of socially consumed services as they focus perhaps more on entertainment. Here it is important to notice that the price the consumer faces (perceived cost) consists not only from the price of the service but also from the price s/he pays e.g. for the data transfer. Based on this assumption one could estimate that the threshold of the usage of entertainment services is lower for those users who have a flat rate

data plan because they don't face any extra cost for mobile internet usage. However my study found no evidence for the importance of perceived cost and hypotheses H6 was rejected.

The analysis of the hypotheses is summarized next:

H1: There is a distinction in effects of different behavioral beliefs between personally and socially consumed mobile services.

→ H1: SUPPORTED

H2: Subjective norm has greater effect on socially- than personally consumed mobile services.

→ H2: REJECTED

H3: There is a distinction between the learning mechanisms (information sources) concerning personally and socially consumed mobile services.

→ H3: REJECTED

H4: Owners of a 3G phone are early innovators and thus have more positive attitude towards mobile services

→ H4: SUPPORTED

H5: Perceived cost of using mobile internet affects the intention to use it.

→ H5: REJECTED

Among the respondents of the study, prior experience about the service in question is considered to be the most reliable source of information. However earlier experience and trialability are not significant predecessors of attitude in the models derived from the survey data. Thus it can be said that own experience about the service serves as a learning mechanism and this information is then used to form beliefs about the service. Prior experience is then not a decision criteria but a learning mechanism.

Hence the main findings of this study can be summarized as follows:

When trying to promote and foster adoption of a (new) mobile service, the service provider has to acknowledge above all two things:

- information sources the consumers find important and reliable (how to reach the consumers), and
- according to the information on hand, acknowledge the attributes the product (in a certain product category) must have and emphasize these attributes in product design and marketing.

9.1 Implications for research

The final models based on the survey among Finnish students implicates that many of the constraints of attitude presented in the earlier studies aren't always significant enough to be considered when measuring intention to use mobile services.

Also the finding that beliefs behind attitudes differ between the two categories questions the meaningfulness of general, even universal, models of (mobile) technology acceptance. Therefore it could be argued that in the case of mobile services, the type of the service in question must be taken into account when trying to determine end-users' intention to use the service.

Earlier adoption literature has focused much on beliefs and attitudes affecting use intentions. However not much has been said about how the beliefs are formed. In this study, I also measured the importance of different information sources to learn which sources have most influence towards an individual's evaluation of mobile services. This offers new information compared to previous research.

9.2 Implications for Lyyra

This study brings to Lyyra knowledge about how the students' feel about different services and what are their intentions to use different (kinds of) services in the near future. This information can be utilized when developing mobile services targeted to students.

However it must be noted that most of the students didn't have much earlier experience on mobile services yet. Also, many of the respondents didn't think that trying new mobile services is easy. Thus, if Lyyra wants to accelerate adoption of mobile services it provides, it could for example build a working demo, for any mobile service it wants to promote, on the Lyyra website, so that students could try the service with minimum efforts and without any cost.

The different beliefs affecting the intentions to adopt personally and socially consumed mobile services as well as the Lyyra specific questions asked from the students will help Lyyra to focus on the essential issues when making decision considering their mobile service portfolio and the design of the individual services and their functions. Also the knowledge about importance of different information sources helps Lyyra to allocate its marketing efforts the right way.

9.3 Applying the results

Results of the study can be utilized in developing of web services in particular in the field of mobile services. This study offers much detailed information about students' present mobile service use and intentions to use different mobile services in the near future. Hence the study indicates what kind of services the students' find useful and valuable and contrary which kinds of services draw less interest. Further, knowledge about important information resources and beliefs underlying attitudes can be utilized when planning marketing and distribution strategies for new mobile services targeted to students. Based on this study mobile service providers can make decisions concerning the possible introduction of different kinds of mobile services.

In more general level the results can be useful for any party interested in mobile internet services, mobile social media, innovation diffusion or technology adoption or consumer behavior.

9.4 Limitations

The questionnaire of the study was not pre-tested before the survey, although a pilot study was conducted to confirm that the model has all the relevant beliefs. Thus the formulation of individual questions may have caused some errors even when the questions were designed carefully in accordance of guidelines derived from earlier research.

The research was conducted in Finland among a certain target group, students. Hence this study suffers from problems with size of geographical area and population. The results may not be directly generalized to the whole population. Factors affecting the attitudes of students may differ remarkably when compared to particularly older population as students of today have used mobile phones and the internet from the beginning of their teen years and may be more comfortable with the new services. Earlier studies (Pagani 2004) have shown that young adults aged from 18 to 24 consider different factors when making adoption decisions than only little older ones from (25-34 years old).

To get precisely comparable results from both categories, ideally the same respondents should have participated in both surveys. This was however not done because of two reasons: 1) the questionnaire was relatively long, and more importantly 2) a person could have been biased in the later questionnaire by the answers she gave in the first one.

It should be noted that intentions are not always a good predictor of behavior. Intentions can obviously change over time (Ajzen & Fishbein 1980:47), thus the intentions measured here are most accurate considering the near future.

10 Summary and conclusions

10.1 Summary

The goal of the study was to find out whether the 1) learning mechanisms (use of information sources), 2) beliefs affecting attitudes and 3) relative importance of attitudes and social norm are different between two service categories: personally and socially consumed mobile services.

The empirical part of the study was carried out as a self-administered survey. A request to fill the questionnaire was sent to 1000 students per category, i.e. 2000 students were asked to participate. Finally 262 answers almost equally divided between the two categories form the final data for analysis.

The goals of the study were met as I managed to find answers to all of the research questions. Based on the framework and proposed research model, I proved that there are significant differences between beliefs affecting attitudes towards personally and socially consumed mobile services. Further, I demonstrated, based on the data from 262 students, that the relative importance of different information sources is in essence similar in both of the research categories. These findings indicate that behaviors behind learning (information retrieval) are more stabile than behaviors behind attitudes towards services of certain service category. Also, the different relative importance of attitude and social norm, both predecessors of intention to use, between the two research categories was empirically proven although the difference was opposite to what was expected based on earlier research.

The results should have in practice most influence on decisions about 1) service design and 2) marketing. Firstly, a mobile service provider should take into consideration that the adoption decision of mobile services are different in product belonging to different service category (here personally and socially consumed services). These differences should guide the design of the product to make it compatible with the beliefs that are influencal to end-users. Secondly, marketing efforts should be targeted towards opinion leaders who have social influence on others as friends, family and colleagues are seen as important information sources regardless of the service category in question. Also, the end user should be able to

test the product easily with free demos or other similar solutions as own experiences about the product are important sources of information.

This study offers notable new findings to the research of consumer behavior, technology adoption and innovation diffusion as some of the findings question some results of earlier studies. Therefore more research of the area is needed to confirm or discard the conclusions of this study.

10.2 Conclusions

Results of the empirical study indicate that there are two main issues a mobile service provider has to take into account when introducing a new mobile service.

Firstly, it is important to notice the relative importance of different information sources. Considering both personally and socially consumed mobile services, own experiences with the service as well as information from friends, family and colleagues were considered more important sources of information than media and advertisements.

Secondly, a mobile service provider has to acknowledge the decision criteria the users have considering the service or service category at hand and emphasize these issues in their product design and marketing. As the discussion above argues these constructs do differ at least between the two categories under study and therefore no common list of these constructs can be presented to help decision making. Hence more research is needed to investigate which constructs are important considering different services and service categories.

10.3 Suggestions for further studies

The main goal of this study was to prove that there are differences between beliefs and attitudes affecting different kinds of mobile services. The study found evidence of this

considering the two research categories. To generalize the results, more studies with the same kind of setting could be done to find out even more differences; for example do the underlying constructs of use intention differ between individual services inside a research category?

As discussed above, according to the results of this study, adoption of mobile services can't be explained with a unified model as the beliefs affecting attitude towards the services differ between the two research categories. Importance of different information sources were however identified to be quite constant considering the two categories and the research data as whole. Hence future research could focus on the information sources and the effects they have on beliefs, attitudes, social norm, use intentions and innovation diffusion in general. Maybe this way a unified model could be formed.

The same data used in this research could also be used to study deeper whether the attitudes and intentions of 3G and non-3G users differ significantly and for which reason. Or, as noted that also non-3G users use the mobile internet, to study whether the attitudes and intentions differ between experienced mobile internet users and those who have no previous experience on these services.

The impact of use context and environmental factors (for example the growth of 3G mobile phone usage, development of devices, and the influences of new pricing models) were outside the scope of this study but they could also offer an interesting subject for future research.

As Rogers (2003:249) points out, treating innovations as clusters makes sense intuitively but it has seldom been investigated. A user can't just take the services into use if she doesn't have a phone that makes internet access possible as well as mobile contract which contains mobile internet access. Thus mobile phone, mobile internet access, and the selection of mobile services form together a technology cluster which could be studied in more detail in future studies.

Lastly, I also measured in the survey confidence levels for different user statements as proposed by Ajzen & Fishbein (1980). However this data was not utilized in the final analyses. This could offer a topic for a future research: how does the confidence toward the evaluation of some attribute effect the models presented here.

References

Ajzen I.; The theory of planned behavior; Organizational Behavior and Human Decision Processes 50, pp. 179–211, 1991

Ajzen I., Fishbein M.; Understanding attitudes and predicting social behavior; Englewood Cliffs, N.J. : Prentice-Hall, 1980

Bandura, A.; Social foundations of thought and action: a social cognitive theory; Prentice-Hall, Englewood Cliffs, N, 1986

Blanchard, Anita; Markus, Lynne; Sense of Virtual Community–Maintaining the Experience of Belonging; Proceedings of the 35th Hawaii International Conference on System Sciences, 2002

Carlsson, Christer; Hyvönen, Kaarina; Repo, Petteri; Walden, Pirkko; Adoption of Mobile Services across Different Technologies; 18th Bled eConference eIntegration in Action; Bled, Slovenia, June 6 – 8; 2005

Chen L, Gillenson ML, Sherrell DL; Enticing online consumers: an extended technology acceptance perspective; Information & Management, Volume 39, Issue 8, September 2002, pp. 705-719, 2002

Constantiou, Ioanna D.; Damsgaar, Jan, Knutsen, Lars; The Four Incremental Steps Toward advance mobile service adoption – Exploring mobile device user adoption patterns and market segmentation; Communications of the ACM; June Vol. 50, No. 6, 2007

Davis Fred D.; Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology; MIS Quarterly, Vol. 13, No. 3. Sep., pp. 319-340, 1989

Funk, J. L.; Mobile disruption: The technologies and applications driving the mobile Internet; Wiley-Interscience; 2004

Funk, J. L.; Solving the startup problem in Western mobile Internet markets; Telecommunications Policy 31, pp. 14–30; 2007

Hartikainen, Pekka; 3G-puhelinten ja mobiilipalvelujen käyttöönotto eri innovaattoriryhmissä; Pro Gradu –tutkielma, Helsingin kauppakorkeakoulu, 2007.

Karahanna, Elena; Straub Detmar; Chervany, Norman; Information Technology Adoption Across Time: A Cross-Sectional Comparison of Pre-Adoption and Post-Adoption Beliefs; MIS Quarterly; Jun; 23,2 ; ABI/INFORM Global, pp. 183, 1999

Katz, Elihu; Blumler, Jay G.; The Uses of Mass Communications: Current Perspectives on Gratifications Research; Beverly Hills, CA, Sage. 1974

Kripanont, Napaporn; Examining a Technology Acceptance Model of Internet Usage by Academics within Thai Business Schools; Doctoral Thesis; School of Information Systems, Victoria University, Melbourne Australia, 2007

Ling, Richard S.; "It Is 'In.' It Doesn't Matter if You Need It or Not, Just That You Have It: Fashion and the Domestication of the Mobile Telephone Among Teens in Norway." At the conference: Il corpo umano tra tecnologie, comunicazione e moda" (The human body between technologies, communication and fashion) at Triennale di Milano, 2001

Luarn P., Lin H.-H.; Toward an understanding of the behavioral intention to use mobile banking; Computers in Human Behavior 21; pp. 873–891, 2005

Lu, June; Liu, Chang; Yu, Chun-Sheng; Wang, Kaliang; Determinants of accepting wireless mobile data services in China; Information & Management, 45, pp. 52-64; 2008

Hsu, Chin-Lung; Lin, Judy Chuan-Chuan; Acceptance of blog usage: The roles of technology acceptance, social influence and knowledge sharing motivation; Information & Management 45, pp. 65–74; 2008

Jannelli, Giuseppe; Oviedo, Diego Mora: Rethinking the Wireless Business Model, Accenture *Outlook* Journal, January 2008. Available at:

http://www.accenture.com/Global/Research_and_Insights/Outlook/By_Issue/Y2008/rethinkingwirelessmodel.htm

Mallat N., Rossi M., Tuunainen V., Öörni A.: An empirical investigation of mobile ticketing service adoption in public transportation; Personal and Ubiquitous Computing, Vol. 12, pp. 57-65; 2008

Moore, G. & Benbasat, I.; Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation; Information Systems Research 2 (3), 192-222; 1991.

Nysveen, H., Pedersen P. E., Thorbjørnsen H.: Intentions to Use Mobile Services: Antecedents and Cross-Service Comparisons; Journal of the Academy of Marketing Science, Vol. 22 No. 3, pp. 330-346, 2005

Okazaki, S.: What do we know about mobile internet adopters? A cluster analysis; Information and Management, Volume 43, Issue 2, March, pp. 127 – 141, 2006

Osgood CE., Suci GJ, Tannenbaum PH; The measure of meaning; Urbana, University of Illinois Press, 1957

Pagani, Margherita; Determinants of adoption of third generation mobile multimedia services; Journal of interactive marketing, Volume 18, number 3, Wiley Periodicals, 2004

Pedersen, Per, E; Adoption of mobile internet services: An exploratory study of mobile commerce early adopters; Journal of organizational computing and electronic commerce 15(2), pp. 203-222, 2005

Rogers, Everett M; Diffusion of Innovations; 5th edition; New York, NY; Free Press, 2003

Saarinen, T; Kallio, J; Tinnilä, M; Vesa, J; Customer Relationship Management in Service Mediary-Driven Mobile Services: Case I-Mode; Information Technology-Enabled Global Customer Service, edited by Tapio Roponen; Idea Group Inc., 2003

Sawyer, Steve; Allen, J. P.; Lee, Heejin; Broadband and mobile opportunities: a socio-technical perspective; Journal of Information Technology; 18, pp. 121-136; June 2003

Shin, D.-H.; User acceptance of mobile Internet: Implication for convergence technologies; Interacting with Computers 19, pp. 472–483, 2007

Taylor, S., & Todd, P. A. Understanding information technology usage: A test of competing models. Information Systems Research, 6(2), pp. 144-176; 1995

Toivonen, Santtu; Web on the Move. Landscapes of Mobile Social Media; VTT Tiedotteita - Research Notes: 2403; VTT, Espoo. 56 p. + app. 3 p; 2007

Tornatzky, LG; Klein, KJ; Innovation characteristics and innovation adoption implementation: a meta-analysis of findings; IEEE Trans Eng Manage 29:28–44; 1982

Venkatesh,V; Morris,M. G.; Davis,G. B.; Davis,F. D; User Acceptance of Information Technology: Toward a Unified View; MIS Quarterly, 27, 3, 425-478, MIS Quarterly & The Society for Information Management; 2003

Wang Yi-Shun, Lin Hsin-Hui, Luarn Pin; Predicting consumer intention to use mobile service Information Systems Journal 16 (2), pp. 157–179; 2006

Yamakami, Toshihiko; Mobile Web 2.0: Lessons from Web 2.0 and Past Mobile Internet Development; Multimedia and Ubiquitous Engineering, 2007

Online-references

Miljoonan 3G-käyttäjän raja pamahti rikki Suomessa, ITviikko.fi, 31.12.2007
http://www.itviikko.fi/page.php?page_id=46&news_id=200733022

Televiestintä 2006, Tilastokeskus, http://www.stat.fi/til/tvie/2006/tvie_2006_2007-06-05_kat_001_fi.html

What Is Web 2.0? Design Patterns and Business Models for the Next Generation of Software, 30.9.2005. http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html

VTT: SOMED - Social media in the crossroads of physical, digital and virtual worlds http://www.vtt.fi/proj/somed/index.jsp?lang=en

"Massive Korean Social Network CyWorld Launches in US", Techcrunch.com, 27.7.2006, http://www.techcrunch.com/2006/07/27/this-is-nuts-cyworld-us-opens-for-use/

"Mobile CyWorld gets 11 visits a day…from one user!", KoreanInsight.com, 14.11.2007, http://www.koreaninsight.com/?p=46

"Cyworld USA to go mobile next year ", Giga Omni Media, GigaOM.com, 1.6.2007, http://gigaom.com/2007/06/01/cyworld-usa-to-go-mobile-next-year/

"Advertising revenue won't make mobile social networking profitable", Analysys research, 28.2.2008, http://research.analysys.com/default.asp?Mode=article&iLeftArticle=2618&m=&n=

"Facebook Launches Mobile Operators Platform; Signs Vodafone as Partner", Mashable.com, 7.2.2008, http://mashable.com/2008/02/07/facebook-mobile-operators-vodafone/

"Huhut naittavat Nokiaa ja Facebookia yhteen", Taloussanomat, 21.1.2008, http://www.taloussanomat.fi/markkinointi/2008/01/21/Huhut+naittavat+Nokiaa+ja+Facebookia+yhteen/20081903/110

"College campuses get social – Social-Networking Services on Cell Phones Keep Students and Faculty Connected" ABC News 11.9.2006, http://abcnews.go.com/Technology/story?id=2411960&page=1

Appendix A: comparison and classification of characteristics affecting "intention to use" described in different models related to acceptance and diffusion of mobile services

Mallat et al. (2008)	Kaasinen (2005)	Wang et al. (2006)	DOI, Rogers (2003)	Nysveen et al. (2008)	Pedersen (2005)	RESEARCH MODEL
Ease of use	Perceived ease of use	Perceived ease of use	Complexity	Perceived ease of use*	Perceived user friendlyness*	Perceived ease of use*
Usefulness	Perceived value	Perceived usefulness	Relative advantage	Perceived usefulness*	Perceived usefulness*	Efficiency benefits*
Attitude				Attitude towards use	Attitude towards use	Attitude towards use
Social influence			Observability	Normative pressure	External influence/interpersonal influence/self-control**	Social influence**
					Subjective norm	Subjective norm
Compatibility	Perceived ease of adoption***		Compatibility		Facilitating conditions	Compatibility & perceived ease of adoption*
Cost		Perceived financial resource	Relative advantage	Behavioral control (skills, financial resources)	Behavioral control	Perceived financial resource*
Prior experience		Self efficacy	Triability		Self efficacy	Prior experience & trialability
Trust	Trust	Perceived credibility				Risk&trust*
Risk						
Use context						
Mobility *("benefits of time and place independent service access and use")*						Independence of time and place*
	Intention to use	Behavioral intention			Intention to use****	Behavioral intention to use
	Taking into use****					
				Perceived expressiveness*		Perceived expressiveness*
				Perceived enjoyment*		Perceived enjoyment*
						+ Social communication*
						+ Information retrieval*

* affects through attitude towards use

** affects through subjective norm

*** affects to "taking into use" after intention to use

**** occurs after intention to use

Appendix B: classification of different mobile services (modified from Nysveen et al. (2005) model)

The services are categorized in the study according to the way they are consumed (socially vs. personally)

Service	Consumed	Type of interactivity	Process characteristics	RESEARCH CATEGORY
Email	Socially	Person-interactive	Experimental	2
Facebook and other social services	Socially	Person-interactive	Experimental	2
Jaiku	Socially	Person-interactive	Experimental	2
Instant messaging (e.g. Messenger)	Socially	Person-interactive	Experimental	2
Loading pictures to internet (e.g. to Flicker)	Socially	Person-interactive	Experimental	2
News services (e.g. HS, YLE)	Personally	Machine-interactive	Goal-oriented	1
Weather services	Personally	Machine-interactive	Goal-oriented	1
Mobile banking	Personally	Machine-interactive	Goal-oriented	1
Public transport time tables and other services (e.g. route planner, VR, HKL, YTV)	Personally	Machine-interactive	Goal-oriented	1
Free time and entertainment (e.g. movies, restaurants)	Personally	Machine-interactive	Goal-oriented	1
Maps and locationing services	Personally	Machine-interactive	Goal-oriented	1
Finding information about products and services	Personally	Machine-interactive	Goal-oriented	1
What to do / where to go guides (e.g. concerts/partys tonight)	Personally	Mixed	Goal-oriented	1
Widsets (platform by Nokia providing many different services)	Personally	Mixed	Mixed	1
Reading blogs other RSS-based feeds	Personally	Mixed	Experimental	1
General web surfing based on need	Personally	Mixed	Mixed	1

Appendix C: Pilot study question forms

Personally consumed mobile services

Focus on personally consumed mobile services. Such are services that are mainly used alone without any interaction with other users.

For example the next services belong to personally consumed mobile services:

- News services
- Weather services
- e-banking
- Public transport timetables *(e.g. travel guide)*
- Entertainment & free time *(different entertainment centered services)*
- Maps and location services
- Finding information from products or services
- Where to go –services *(clubs, concerts)*
- Widsets *(platform for widgets in Java-enabled mobile phones)*
- Mobile television
- Location based services
- Blogs and RSS-feeds
- Whatever websites, based on need
- Any other services that fits this category

What do you believe are the advantages and disadvantages of socially consumed mobile services?

Socially consumed mobile services

Focus on socially consumed mobile services. Such are services that are used with a mobile device in different ways of interacting with others.

For example the next services belong to socially consumed mobile services:

- Email
- Status updates in Facebook or similar service
- Jaiku *(microblogging service, similar to e.g Twitter or Pownce. See www.jaiku.com)*
- Communicating with friends (one or more) in Facebook or similar service
- Watching (and commenting) friends' pictures in Facebook or similar service
- Instant messaging *(e.g. MSN messenger)*
- Uploading pictures from phone to the internet *(e.g. to Flickr or Facebook)*
- Uploading videos from phone to the internet *(e.g. to Flickr or Facebook)*
- Any other services that fits this category

What do you believe are the advantages and disadvantages of socially consumed mobile services?

Appendix D: Survey questions and summary results

	Averages of given answers to all questions in both categories										Personally consumed	Socially consumed	Combined data
	Basic information												
1	Age										28,4	29,3	28,9
2	University	[list of Finnish universities]											
4	Do you own a 3G -phone	1 = yes | 2 = no | 3 = don't know									1,8	1,8	1,8
5	Have you used internet with your mobile	1 = yes | 2 = no | 3 = don't know									1,5	1,6	1,5
	Perceived ease of use												
1	Using mobile services is easy for me	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,7	3,3	3,5
2	Mobile services suite well to be used with mobile devices	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	4,2	4,1	4,1
3	How confident you are that using mobile services is easy for you	*extremely sure*	+3	+2	+1	0	-1	-2	-3	*extremely unsure*	3,4	3,3	3,3
	Efficiency benefits												
4	I find mobile services useful	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,3	3,7	3,5
5	Use of mobile services would make my life easier	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,6	4,0	3,8
6	The use of mobile services offers benefits compared to the devices and services I've used earlier	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	4,0	4,3	4,2
7	Use of mobile services helps me save time	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,8	4,2	4,0
	Using mobile services would improve my efficiency	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	4,1	4,4	4,3
8	Mobile services offer new useful possibilities	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,4	3,5	3,4
9	How confident you are that mobile services are useful	*extremely sure*	+3	+2	+1	0	-1	-2	-3	*extremely unsure*	3,5	4,0	3,7
	Independence of time and place												
10	Mobile services are useful because I can use them anywhere	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	2,7	3,1	2,9
11	Mobile services are useful because I can use them anytime	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,0	3,1	3,1
	Attitude towards use												

12	Using mobile services is sensible	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,6	3,9	3,8
13	Mobile service use is/would be a positive addition to my life	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,9	4,2	4,1
14	Trying out mobile services is pleasant to me	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	4,0	3,9	3,9
15	I intend to adopt new services among the first ones	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	5,2	5,2	5,2
16	I don't fancy learning to use new technology	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	4,7	4,9	4,8
17	My attitude towards mobile services is	*extremely positive*	+3	+2	+1	0	-1	-2	-3	*extremely negative*	3,6	3,6	3,6
18	How confident you are that using mobile services is sensible	*extremely sure*	+3	+2	+1	0	-1	-2	-3	*extremely unsure*	3,6	4,0	3,8
	Social influence												
19	Using mobile services gives a good image from me to others	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	4,5	4,6	4,5
20	People whose opinion I value have recommended mobile services to me	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	5,2	5,2	5,2
21	I could use mobile services even tough its benefit would be hard to argue to others	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,4	3,4	3,4
22	People close to me use mobile services a lot	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	4,8	4,8	4,8
23	I prefer services with many users	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	4,5	4,4	4,5
24	How confident you are that using mobile services gives a good image from you to others	*extremely sure*	+3	+2	+1	0	-1	-2	-3	*extremely unsure*	4,7	4,7	4,7
	Compatibility and perceived ease of adoption												
25	Adoption of mobile services is easy for me	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,4	3,4	3,4
26	Mobile services support use of the services in different platforms	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,5	3,4	3,5
27	Use of mobile services fits my manners and habits	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	4,2	4,1	4,2
28	If needed, I find guides and information to be able to adopt mobile services	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,2	3,3	3,2
29	How confident you are that adoption of mobile services is easy for you	*extremely sure*	+3	+2	+1	0	-1	-2	-3	*extremely unsure*	3,2	3,3	3,3
	Perceived financial resources												
30	Data transfer prices limit my mobile service use	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	2,8	2,8	2,8
31	The price of the services limit my mobile service use	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	2,9	3,1	3,0
32	I have needed financial resources to be able to use mobile services	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,4	3,5	3,5
33	How confident you are that you have the needed financial resources to be able to use mobile services	*extremely sure*	+3	+2	+1	0	-1	-2	-3	*extremely unsure*	3,2	3,5	3,4
	Prior experience & trialability												

34	I have tried mobile services	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,4	3,9	3,6
35	I adopt new services quickly	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,0	3,2	3,1
36	I think trying new mobile services is easy and effortless	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,7	3,9	3,8
37	How confident you are that you adopt new services quickly	*extremely sure*	+3	+2	+1	0	-1	-2	-3	*extremely unsure*	2,8	3,1	3,0
	Trust and risk												
38	Mobile services and companies offering them are reliable and safe	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,9	4,1	4,0
39	My personal information is safe when using mobile services	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	4,2	4,5	4,4
40	Privacy doubts don't limit my use of mobile services	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,8	4,1	3,9
41	How confident are you that mobile services and companies offering them are reliable and safe	*extremely sure*	+3	+2	+1	0	-1	-2	-3	*extremely unsure*	4,0	4,4	4,2
	Perceived expressiveness												
42	I can express my self to others through mobile services	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	4,9	4,3	4,6
43	Other are expressed by my mobile service use	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	5,7	5,6	5,7
44	How confident you are that you get appreciation from others by using mobile services	*extremely sure*	+3	+2	+1	0	-1	-2	-3	*extremely unsure*	5,4	5,5	5,4
	Perceived enjoyment												
45	Using mobile services is entertaining	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	4,2	3,8	4,0
46	Using mobile services is fun	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	4,2	3,9	4,1
47	How confident you are that using mobile services is entertaining	*extremely sure*	+3	+2	+1	0	-1	-2	-3	*extremely unsure*	4,1	4,0	4,1
	Intention to use												
48	I intend to try mobile services during the next six months	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	4,2	4,1	4,1
49	I intend to use mobile services during the next six months	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	4,2	4,3	4,3
50	I intend to recommend mobile services during the next six months	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	5,2	5,4	5,3
51	My willingness to use mobile services will likely increase in the future	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,4	3,7	3,6
52	How confident you are that you intend to use mobile services during the next six months	*extremely sure*	+3	+2	+1	0	-1	-2	-3	*extremely unsure*	3,9	4,1	4,0
	Evaluate the importance of following information sources												
53	Prior experience, getting to know the services	*extremely*	+3	+2	+1	0	-1	-2	-3	*meaningless*	2,1	2,4	2,2

		important											
54	Friends, family and colleagues	*extremely important*	+3	+2	+1	0	-1	-2	-3	*meaningless*	2,6	2,7	2,7
55	Unbiased sources (e.g. consumer agency)	*extremely important*	+3	+2	+1	0	-1	-2	-3	*meaningless*	3,3	3,3	3,3
56	Media, mass media, advertisements	*extremely important*	+3	+2	+1	0	-1	-2	-3	*meaningless*	3,9	4,0	3,9
	Social communication												
57	Mobile services help me to keep contact with my friends	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	4,6	4,0	4,3
58	Communication enabled by mobile services is important to me	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	5,0	4,9	4,9
59	How confident you are that mobile services help you to keep contact with your friends	*extremely sure*	+3	+2	+1	0	-1	-2	-3	*extremely unsure*	4,7	4,4	4,6
	Information retrieval												
60	Mobile services enable fast information retrieval	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,2	3,6	3,4
61	How confident you are that mobile services enable fast information retrieval	*extremely sure*	+3	+2	+1	0	-1	-2	-3	*extremely unsure*	3,1	3,8	3,5
	Threat of addiction												
62	One can get addicted to mobile services	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,2	2,8	3,0
63	Time I spend with mobile services is away from something more important	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,5	3,4	3,4
64	How confident you are that one can get addicted to mobile services	*extremely sure*	+3	+2	+1	0	-1	-2	-3	*extremely unsure*	3,2	2,9	3,0
II	**Lyyra questions**												
1	Are you registered in Lyyre web service (lyyra.fi)?	1 = yes | 2 = no | 3 = don't know									1,5	1,3	1,4
2	My attitude towards Lyyra as service providers is ***I would be willing to use the service now or in the future***	*extremely positive*	+3	+2	+1	0	-1	-2	-3	*extremely negative*	3,2	3,4	3,3
3	Chech the balance on my Lyyra card	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,7	3,5	3,6
4	Transfer money from my e-bank to Lyyra account	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,8	3,9	3,9
5	Upload pictures to Lyyra web service	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	5,7	5,7	5,7
6	Upload videos to Lyyra web service	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	6,0	5,9	6,0
7	See my friends photos in the service	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	5,4	5,4	5,4
8	Buy or download music to my mobile	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	5,4	5,2	5,3
9	Get news and information from my student organization	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	4,6	4,5	4,6
10	See todays menus in student cafeterias	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,5	3,1	3,3
11	See event calendar	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	4,4	4,2	4,3

12	See what benefits I can get with my student card	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,7	3,2	3,5
13	See public transport time tables	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	3,8	3,5	3,6
14	Find the nearest student cafeteria from map	*strongly agree*	+3	+2	+1	0	-1	-2	-3	*strongly disagree*	4,2	3,9	4,0